Work analysis in hospitals.

Assessment of job demands, stressors, and resources

André Büssing & Jürgen Glaser

Reports of the Chair of Psychology at the TU München

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Abstract

The report introduces the "Work Analysis Instrument for Hospitals (TAA-KH)" to a broader international public because work analysis in hospitals is a rather underdeveloped topic within work and organisational psychology in Germany and other countries. The first section of the report deals with the theoretical background of the instrument. Here, the OTI-concept is introduced because it meets the methodological demands of work analysis in complex organisations like hospitals and provides a theoretical background for an understanding of structures and processes of service work in hospitals. The TAA-KH subsumes a self-report version (TAA-KH-S) for analysing and assessing job demands, work stressors and resources especially of nursing tasks and an expert-rating version for Task Analysis and Organisation Diagnosis (TAA-KH-O). Both versions are described with respect to structure, reliability, validity, and application. A case-study dealing with an evaluation of the implementation of a holistic nursing system in a general hospital and the final discussion of the TAA-KH illustrate the advantages of systematic and comprehensive work analysis for work redesign and organisational development in hospitals.
1 Work analysis in hospitals and nursing systems

In work and organisational psychology it is a basic idea that job design needs analysis and analysis should precede and not follow design (e.g. Drenth, 1998; Oldham, 1996; Ulich, 1998). For the assessment and evaluation of work and organisation in industry and the service sector we can rely on a variety of instruments (e.g. Dunckel, 1999; Landau & Rohnert, 1989). However, in human services and especially in nursing care and medicine within hospitals working tasks have many exceptions, high variability, high unpredictability, and are often not well understood (Perrow, 1965). Moreover, the “production of health” in the interaction between persons follows the “uno actu-principle” (cf. Herder-Dorneich & Kötz, 1972). This means that person-related services can only be performed in situations where both service provider and service consumer are present and have personal contact, and where the “product” is immediately consumed during the service episode.

Moreover, health care service work is usually immaterial, its "products" are transient, to a large degree independent of time and place, and they are neither storable nor transportable (cf. Littek, 1991). Therefore, this service tasks can hardly be compared with tasks of industrial production. Whereas production/technical services primarily focus on the development, production and maintenance of material or immaterial goods which can be more or less easily evaluated with respect to well-known quality and output characteristics, person-related service work deals with information and symbols and therefore the quality of these services is difficult to assess and existing instruments fail to be valid (cf. Büssing & Glaser, 1999a). In addition, like organisations in general - hospitals in particular are socio-technical systems with comparatively complex goals and sophisticated clients; they consist of a diversity of (semi-)professions with different backgrounds and standards, use advanced technology and cover an open, network-like system of diverse actors as for example insurance companies, medical and pharmaceutical industry, communities or doctors in private praxis.

This characterisation does not only reveal an obvious demand for – so far rarely available - work analysis instruments in hospitals, moreover it indicates a necessity for a specific and differential validity of these instruments. In the centre of this report will be the introduction of a work analysis instrument for hospitals. The development of this instrument is part of a research process dating back to early studies in mental health hospitals and running through several stages of extension and revision (e.g. Büssing, 1992; Büssing & Glaser, 1993). While the instrument is conceptualised as a method for hospitals and their different professional groups its starting point and specialisation is the nursing process because nursing - as the by far largest professional group with the closest and most frequent interaction with patients - is in the core of the system of care, service and therapy. Therefore, any work analysis
instrument for hospitals largely depends upon the way in which it addresses the nursing system, its structures and processes in the hospital as a whole.

The “Work Analysis Instrument for Hospitals (TAA-KH)”\(^1\) meets the need for systematic assessment and evaluation of work in hospitals and in nursing as a basis for work redesign. In the first sections of this report the theoretical background of the instrument and its roots in action regulation theory and in the Organisation-Activity-Individual-Concept are outlined. After sketching the conceptual fundament the structure of the instrument is presented in section 3. The TAA-KH comprises two versions: the self-report version TAA-KH-S and the expert rating version TAA-KH-O each focusing on different levels of analysis of the hospital organisation. Both versions are conveyed with regard to their specific concepts, structures and methodology. Reliability and validity of the methods and the application of the instrument are described in section 4 while a case study in section 5 as well as the final discussion gives some ideas of potential benefits of the assessment and evaluation by means of the Work Analysis Instrument for Hospitals.

2 A theoretical framework for multi-level analysis of work in hospitals

The starting points for analysing work action are *tasks*. They are intersections between the individual and the organisation (Büssing, 1992; Oldham, 1996; Volpert, 1987). Tasks are related to goals which direct the psychological functions of anticipation, intention and control in the process of regulating work activities (Hacker, 1985). Goal-directed action can be analysed from two connected points of view: from a procedural perspective action can be divided into the sequential phases of planning, execution and feedback, whereas from a more structural perspective action is regulated by cognition at different hierarchical levels (see Hacker, 1994). According to these two perspectives action regulation theory comes up with the *concept of complete activity* which claims that action should be complete in a sequential (procedural) as well as in a hierarchical way. Sequential completeness of tasks means that any of the phases of planning, execution and feedback belonging to one task should ideally be performed by one person. In the hierarchical perspective of complete activity the regulation process is divided into three different levels: basic sensumotoric regulation, perceptive-comprehensive regulation and intellectual regulation of tasks. Complete activity due to this hierarchical perspective requests regulation activities within working tasks on all three hierarchical levels.

\(^1\) The abbreviation TAA-KH is derived from the German title of the instrument „Tätigkeits- und Arbeitsanalyseverfahren für das Krankenhaus“.  

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4
Incomplete activities are therefore characterised by reduced opportunities for autonomous goal setting, by deficient decision potentials, by a lack of opportunity to deal with conditions in a cognitive, particularly intellectual way, by a lack of opportunity for co-operation as well as by infrequent demands for action in general (Hacker, 1985). The concept of complete activity within the action regulation theory can be seen as counterpart to the wide-spread tayloristic concept of work organisation which implies partialised and fragmented sequential phases and a strict hierarchical organisation of work. The criteria of complete activity are comparable to core dimensions of other concepts dealing with conditions of humane work (e.g. Hackman & Oldham, 1976).

Two concepts derived from action regulation theory describe an important distinction: Due to the concept of regulation demands (e.g. Volpert, 1982; Volpert et al., 1983) job demands are described and analysed with regard to their underlying "mental structure“, i.e. with respect to their level of psychological work regulation such as movement execution, information processing or planning; therefore, job demands provide possibilities for learning and personality enhancement in the work process. In contrast, work stressors are potentially disturbing the processes of psychological work regulation and are therefore conceptualised as regulation problems. In other words, work stressors are regulation problems in the sense of obstacles, barriers or hindrances in the work process; important sources can be flaws in the technical and organisational set-up of the work task. They are likely to cause strain respectively impair health (for details Frese & Zapf, 1994; Greiner et al., 1997). Both concepts have been operationalised in different instruments for the analysis of industrial work and office work.

Whereas working tasks in action regulation theory are explained with respect to their psychic regulation, a broader perspective is necessary to understand the relationships between antecedents, characteristics and consequences of work processes in complex organisational systems. Such a perspective has to consider the structural conditions of task performance and their influence on the specific task regulation as well as the specific consequences for the individual. Büssing (1992) integrates these perspectives by introducing the “Organisation-Activity-Individual (OTI)2“-concept. The OTI-concept is closely related to the theory of action regulation because the main focus of the concept is the regulation of work tasks and their reciprocal relationships with the organisational structures on one side and with the individual and its development and well-being on the other side. It proceeds from the fact that the characteristics of organisational structures and processes in a hospital system are mediated to the individual by the characteristics of working activities. On the individuals side they contribute to organisational behaviour, well-being, psychological stress or burnout (see figure 1).

2 The abbreviation „OTI“ is derived from the German title of the concept „Organisation-Tätigkeit-Individuum“.
The OTI-concept integrates the organisational embedding of working tasks and the processes of action regulation. That is, on the one hand working tasks are related to organisational structures and represent central elements of the socio-technical system and on the other hand working tasks are related to the individual. By performing tasks the individual not only changes the work environment and work demands, it also develops and changes itself within these reciprocal relationships. For example, the hierarchical structure of an hospital strongly influences the nurse’s autonomy to perform working tasks in an individual manner, autonomous task performance in turn has proved to be beneficial for the enhancement of personality and health (e.g. Karasek & Theorell, 1990). In the centre of these processes are the work activities and their characteristics; it is the work activity which mediates this relationship between individual and the organisation (see Büssing, 1992).
Methodological implications for work analysis in hospitals

What are the methodological implications of the concept? First of all, according to the OTI-concept a multi-level analysis is necessary (Büssing, 1990; Rousseau, 1985) which enables data collection at different hierarchical levels of the organisation: organisation of the hospital, working tasks at the ward, work activities of individual nurses. Against the common theoretical background of the OTI-concept a valid integration of data from different organisational levels is possible. Second, different levels in organisations require a level-specific validity of analysis. Once more, against the background of the OTI-concept different instruments for analysis can be developed which are not only useful to depict specific characteristics of organisational levels in hospitals but also allow an integrated and valid strategy for comparison of results from different levels.

Analysis of working tasks, for example, require observational methods because work behaviour and the temporal sequence of movement and action patterns are the focus of interest. Although observations will reveal much information, they are not suitable to study the underlying mental processes, i.e. the psychologically most relevant "deep structure" of work activities that is not necessarily identical with the observable logical structure of the task. Therefore, observations must be accompanied by interviews with the worker to inspect the psychological aspects of observed work behaviour. Furthermore, methods of observation and interview should be based on the same theoretical background – for example the aforementioned concepts of regulation demands and regulation problems – so that the results can be related and integrated into a realistic picture of work processes in hospitals.

3 The structure of the “Work Analysis Instrument for Hospitals (TAA-KH)”

According to the OTI-concept we developed the "Work Analysis Instrument for Hospitals (TAA-KH)" for an assessment and evaluation of work in hospital organisations. The “Work Analysis Instrument for Hospitals” consists of two versions: a self-report version TAA-KH-S and an expert-rating version TAA-KH-O. Both versions are condition-related, they can be employed to examine organisational, work and task characteristics; however, they are not suitable for analysing individual characteristics of workers and personal working styles or behaviour.

The "Work Analysis Instrument for Hospitals (TAA-KH)" is conceptualised as a multi-level and multi-method instrument. Against a common theoretical background it can be used for an investigation of working conditions and structures at each level of the hospital organi-
sation with different methods. In looking at subsystems of hospitals from different points of view - from the organisational level, the perspective of working tasks and task characteristics as well as from the perspective of the individual - the validity of the results can be substantially enhanced and the complex reality of the socio-technical system can be more adequately described.

The instrument consists of different modules. A detailed analysis at the organisation level – the Organisation Diagnosis - is performed by means of interviews and document analyses as part of the expert-rating version TAA-KH-O. At the level of the ward (the working place in nursing) task analyses with regard to nursing activities are performed by means of observation-interviews, i.e. complete shift observations by external experts combined with additional interviews in order to assess regulation requirements and regulation problems. By means of the self-report version TAA-KH-S nursing tasks can be specifically analysed with regard to job demands, work stressors and resources. The TAA-KH-S includes a condition-related questionnaire which considers essential characteristics of complete activities (see above). "Self-report" does not mean that the focus is directed to subjective, individual perspectives or to personal working styles or behaviour. Rather, the condition-relatedness of the TAA-KH-S means that the instrument allows the inspection of conditions of nursing tasks at a ward. An essential prerequisite of a condition-related way of analysis is that participants are what is called an “ideal-typical nurse”; these nurses are by definition examined, well-trained and no longer in a stage of learning (see Leitner et al., 1993). In order to phrase the items of the TAA-KH-S in a condition-related way working conditions were operationalised as statements which abstract from individual opinions and attitudes.³

Figures 2a and 2b give an overview of the structure of the TAA-KH. The following sections will present the three components of the TAA-KH in more detail: the self-report version and the expert rating version with its components "Task Analysis" and "Organisation Diagnosis".

³ In addition, on the individual level person-related questionnaires which are not part of the condition-related TAA-KH are administered in our studies assessing the individual’s attitude towards work as well as psycho-physiological health and health-related behaviour of the individual workers.
Figure 2a: Structure of the Self-Report Version of the Work-Analysis Instrument for Hospitals (TAA-KH-S)

- **Domain S.1**
  - "Demands for activity and qualification"
  - 2 Sections
  - 15 Scales
  - 95 Items

- **Domain S.2**
  - "Transparency, activity latitudes and participation"
  - 3 Sections
  - 9 Scales
  - 70 Items

- **Domain S.3**
  - "Personnel, material and social resources"
  - 3 Sections
  - 14 Scales
  - 113 Items

- **Domain S.4**
  - "Organisational and social stressors"
  - 2 Sections
  - 9 Scales
  - 49 Items

- **Domain S.5**
  - "Regulation problems"
  - 6 Sections
  - 15 Scales
  - 115 Items
Figure 2b: Structure of the Expert Rating Version of the Work-Analysis Instrument for Hospitals (TAA-KH-O)
Self-Report Version (TAA-KH-S)

The self-report version TAA-KH-S is a questionnaire for analysing and assessing work characteristics and working conditions of nursing on hospital wards; it focuses on job demands, work stressors and resources. Like the TAA-KH in general the TAA-KH-S in particular is based on the OTI-concept, the action regulation theory and related concepts of regulation demands and regulation problems (see Büssing & Glaser, 1999b, 1999c). The instrument is divided into five domains (see figure 2a) which are described and illustrated by examples in the following paragraphs.

The first Domain S.1 "Demands for activity and qualification" of the self-report version TAA-KH-S concentrates on job demands. It subsumes two sections comprising 15 scales and 95 items. The scales of this domain are primarily concerned with work characteristics and conditions which can exert an influence on personality development and learning on the job. Examples of scales are task variability ("Working at this ward one has to perform a variety of different tasks"), complexity of tasks ("Working at this ward one has to consider different aspects simultaneously"), responsibility ("Working at this ward one is also responsible for work processes in general"), qualificational requirements ("Working at this ward one needs to have exceptional social skills") or learning demands ("Working at this ward one has to acquire new knowledge regularly").

Domain S.2 "Transparency, activity latitude and participation" as well as Domain S.3 "Personnel, material and social resources" are concerned with work-related resources. One important aspect of work-related resources is autonomy at work. Other aspects of these sections are transparency, participation as well as personnel resources (i.e. adequacy of staff), material resources (i.e. adequate design of rooms) and social resources (i.e. social climate, feedback by supervisors).

For example autonomy is operationalised by a questionnaire in Domain S.2 of the TAA-KH-S. The questionnaire measures the degree of activity latitudes in nursing. It consists of three subscales which focus on various aspects of decision latitudes, action latitudes and design latitudes (e.g. "Working at this ward one is able to decide when to perform which task"). In total the activity latitude scale includes 18 items.

The final two domains of the self-report version S.4 "Organisational and social stressors" and S.5 "Regulation problems" are devoted to work stressors. Work stressors are subdivided into three categories: organisational stressors, social stressors and regulation problems. Domain S.4 deals with organisational and social stressors. Both can be considered major interpersonal and organisational causes for job strain in nursing. The relationship with superiors, colleagues and clients as well as organisational factors like shortage of staff or uncertain information are also part of the organisational and social stressor items.

Regulation problems in Domain S.5 represent the most elaborate and theory-driven form of work stressors within the TAA-KH-S. The concept of regulation problems (cf. Greiner et
al., 1997) defines regulation problems as obstacles, barriers and hindrances. Regulation problems are observable discrepancies between (a) different task goals (e.g. contradictory instructions from different superiors), (b) between tasks and learning conditions (e.g. having to handle new technology without adequate introduction) or between (c) tasks and performance conditions (e.g. being interrupted in the course of task performance). These different types of obstacles, barriers and hindrances (work stressors) are leading to so-called first order and second order outcomes. The first order outcome of regulation obstacles is work stress in terms of additional effort, increased effort or risky action (see figure 3). That is, regulation obstacles and barriers create a dilemma: a nurse cannot fulfill the work task because of obstacles like interruptions, deficient equipment, and so forth, however, she has to perform the job in a certain way. If this dilemma is associated with objective negative consequences, such as additional, intensified or unsafe, risky work, then, by definition, regulation problems constitute objective work stressors. The aforementioned outcomes of work stressors are called work stress (for further details see Büssing & Glaser, 1999d).

Figure 3: The concept of work stressors, work stress and strain

As an illustration for contents of Domain S.5 five scales measuring regulation problems (work stressors) and three scales measuring additional effort, increased effort, and risky action (work stress) are described in short: Informational impediments are measured by an 18-item questionnaire dealing with informational problems (e.g. missing information, unclear information) which are responsible for impediments in the task performance of nurses (e.g. "At this ward necessary information is often not available"). Motoric impediments are measured by a 6-item questionnaire dealing with deficiencies of rooms or equipment which may cause hindrances in the motoric performance of working tasks (e.g. "Working at this ward is often impeded due to architectural drawbacks, e.g. narrow doorways"). Interruptions by persons are measured by a 6-item questionnaire directed to main sources of interruptions in nursing caused by certain groups of persons or due to certain person-related functions (e.g. "Working at this ward one is often interrupted by telephone calls"). Interruptions by functions are measured by a 6-item questionnaire comprising different forms of malfunctioning equipment (e.g. "At this ward working is often interrupted due to defects in technical equipment"). Interruptions by blockades are measured by a 6-item questionnaire; items describe interruptions of nurses’ actions which force nurses to wait some time...
before continuing work (e.g. "Working at this ward is often delayed due to waiting for elevators"). Three further scales of Domain S.5 are dealing with work stress in terms of additional effort, increased effort, and risky action: Additional effort is measured by means of 8 items which describe situations of additional work requirements due to regulation problems (e.g. "Working at this ward one has to repeat actions due to interruptions"). Increased effort comprises 5 items. In contrast to the ‘additional effort’-items increased effort describes intensified working as a consequence of regulation problems (e.g. "Working at this ward one has to exert oneself in order to perform tasks due to motoric impediments"). Risky action consists of 7 items dealing with regulation problems which can only be managed by acting in an unsafe or risky manner, e.g. neglecting respectively violating certain rules (e.g. "Working at this ward one has to violate hygiene rules in order to get ready with ones tasks").

**Task Analysis**

The method of Task Analysis constitutes the first domain (O.1) of the expert rating version TAA-KH-O. As outlined in figure 2b the task analysis consists of four different sections: analysis of general characteristics of the ward, analysis of regulation demands, analysis of regulation problems and an inventory of work functions.

The Task Analysis contains three different methods of data collection. An interview with the ward nurse focuses on main characteristics of the ward (section O.1.1) and provides specific descriptions of the environment and conditions of the nursing tasks. In complete shift observations well-trained and experienced nurses are accompanied and sequences of their work operations are documented in detail on the basis of an Inventory of Work Functions (section O.1.4). This inventory covers 43 categories and each of them is comprising 5 up to 15 single work functions. The 43 categories of work functions are arranged in three subsections: patient-related nursing (i.e. functions of mobilising and body care), diagnosis- and therapy-related nursing (i.e. assisting doctor’s rounds, injections) and team-related administration (i.e. reports, directing students). During the shift observation any observable regulation demand and regulation problem is registered; moreover, some general characteristics of the ward are documented (e.g. work organisation, equipment). The data collected during the shift observation are evaluated and completed with the observed nurse after the shift by means of a standardised interview.

The examination of regulation demands (section O.1.2) includes a description of work operations and their analysis through an algorithm of questions. This algorithm allows for an assessment of different levels of action regulation as described in the hierarchical five-level model of action regulation according to Oesterreich (1981) - (see table 1; cf. Frese & Zapf, 1994).
Table 1: **Hierarchical five-level model of action regulation**

<table>
<thead>
<tr>
<th>Level 5: Development of new action spheres</th>
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<tbody>
<tr>
<td>The highest hierarchical level 5 describes the development of new action spheres. This level is assigned if plans for new tasks or socio-technological processes have to be developed and co-ordinated. An example from nursing is the implementation of a new nursing system which implies consequences for personnel plans and task descriptions.</td>
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<tr>
<th>Level 4: Co-ordination of action spheres</th>
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<tr>
<td>Level 4 is concerned with the co-ordination of action spheres. At this level the result of the work task cannot be predetermined in detail. Several interrelated goals and action spheres of the work domain have to be planned and co-ordinated like for example the assignment of nurses to wards or the management of the whole nursing service.</td>
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<tr>
<th>Level 3: Subgoal planning</th>
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<tr>
<td>Level 3 describes what is called subgoal planning; it is assigned if a restricted number of subactivities have to be planned. After achieving a subgoal, the plan to attain the next subgoal has to be thought through. Requirements of the management tasks of a ward nurse in a traditional nursing system with clear hierarchical structures are examples for level 3 in nursing; like preceding decisions have to be made concerning the daily work processes of the nursing staff before specific action can be planned.</td>
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<tr>
<th>Level 2: Action planning</th>
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<tr>
<td>The assignment of level 2 is bind to an action planning, that means, only the sequence of work steps has to be planned and by combining different concrete and familiar movement programs it is possible to plan the whole task in advance. Typical examples are activities which request only a single autonomous decision, e.g. if the doctor has to be consulted before mobilising a patient.</td>
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<th>Level 1: Sensorimotor regulation</th>
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<td>The lowest level 1 in the hierarchy is assigned if mere sensorimotor work regulation is necessary. At this level an action can be carried out without conscious regulation; however, the work regulation at this level must not be totally determined and small variations in work material, work results, and use of tools may occur. Cleaning activities, assisting or preparing routine diagnostic activities are typical examples for a level 1 in nursing.</td>
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The module for an exploration of regulation problems constitutes section O.1.3 of the Task Analysis. Five different forms of regulation problems (see above description of regulation problems as part of Domain S.5 of the self-rating version TAA-KH-S) are investigated during shift observations and during the interview with the observed nurse using standardised theory-based criteria. The primary goal of this investigation is first to identify regulation problems and second to inspect their consequences for action regulation in terms of additional or increased effort and risky action. The estimation of this unavoidable work stress is crucial.
because it gives a clear impression of the degree of harmfulness and detrimental objective influences of work stressors (e.g. Büssing & Glaser, 1999e).

The Task Analysis as part of the TAA-KH-O aims at an investigation of demands, work stressors and work stress within the observable nursing process. Therefore, the Task Analysis is directed to information which cannot easily be gathered by self-report methods in sufficient detail, authenticity, and depth. Moreover, process-related information and facts which are collected by an observation of work process characteristics assure an adequate assessment of nursing tasks because the embedding of the tasks within the entire work organisation and the socio-technical processes of the hospital can be taken into account. This is a major reason why results of the Task Analysis are particularly relevant for purposes of work redesign and reorganisation (see Büssing, 1997).

**Organisation Diagnosis**

The *Organisation Diagnosis* (Domain O.2 of TAA-KH-O) aims at an examination of the relevant basic data and figures of the structure of the entire hospital, of interfaces inside and outside the hospital, of the technical systems in administration and care, and of the human resource management and the organisation of work processes. The diagnosis addresses the managerial perspective as well as the perspective of key experts in the hospital. The data are collected by means of a detailed half-standardised interview manual. In addition, documents, statistics, and memos are inspected which provide basic statistical material about the hospital and inform for example about the number of employees, patients or length of stay.

In sum 31 topics divided into 6 sections are covered by the Organisation Diagnosis (see overview in figure 2b; for topics see table 2). These topics have been derived from organisation and management theory and from specific concepts of hospital organisation. The topics subsume general characteristics (i.e. legal form, size), aspects of the formal structure of organisations (see below), specific aspects of the hospital organisation (i.e. data processing systems, medical equipment), aspects of human resource management (i.e. employment contracts, working time system), factors of the organisational environment (i.e. co-operation with other institutions, labour market) as well as an analysis of weak points.
### Table 2: Sections and topics of the Organisation Diagnosis

<table>
<thead>
<tr>
<th>O.2.1 General characteristics of the hospital</th>
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<tbody>
<tr>
<td>Characteristics of upholder</td>
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<td>Factors of location</td>
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<td>Spatiality conditions</td>
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<td>Facilities for employees</td>
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<td>Basic figures and professional orientation</td>
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<td>Important organisational changes</td>
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<td>Organisational goals</td>
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<th>O.2.2 Formal structure of the hospital</th>
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<tr>
<td>Specialisation</td>
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<td>Configuration</td>
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<td>Delegation of decision and co-ordination</td>
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<td>Formalisation</td>
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<th>O.2.3 Specific structural characteristics of the hospital</th>
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<td>Personal data</td>
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<td>Performance data</td>
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<td>Finances</td>
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<td>EDP</td>
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<td>Medical-technical equipment</td>
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<th>O.2.4 Human resource management of the hospital</th>
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<td>Employment contract</td>
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<td>Salary</td>
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<td>Duty roster</td>
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<td>Working time</td>
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<td>Education and training</td>
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<td>Further training</td>
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<td>Personal selection and development</td>
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<td>Controlling and personal assessment</td>
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<td>Works council</td>
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<td>Co-operation and conflict</td>
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<th>O.2.5 Organisational environment of the hospital</th>
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<tr>
<td>Labour market</td>
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<td>Co-operation of the hospital with other organisations</td>
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<td>Co-operation of the works council with other organisations</td>
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<th>O.2.6 Weak points and perspectives of the hospital</th>
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<tr>
<td>Weak points of the hospital</td>
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<td>Perspectives of the hospital</td>
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4  **Reliability, validity, and application of the “Work Analysis Instrument for Hospitals (TAA-KH)”**

**Reliability and validity of the TAA-KH**

A main requirement on psychological work analysis is reliability and validity of the data. Depending on the different domains of the TAA-KH different strategies for assuring the methodological standards of the measures were chosen.

Up to now the TAA-KH-S has been applied in 15 hospitals, at more than 250 wards with a total sample of more than 2,000 nurses. The last revision of the instrument was performed in 1995 and the revised version has been investigated in a study of 536 nurses so far. Results on reliability and validity of the instrument reported here are based upon this sample. Objectivity of the TAA-KH-S is regarded as sufficient because the instrument is standardised and provides clear and precise rules for performance, evaluation and interpretation (i.e. norm tables and profiles). Reliability of the TAA-KH-S has been calculated by internal consistency estimation according to Cronbach’s alpha.

More than half of the scales (33 of 62 scales) show good reliability values ($\alpha$) above .80. Further 19 scales reach satisfactory reliability with values of above .70, seven scales with $\alpha \geq .60$ are regarded as sufficient. Only three scales accomplish insufficient reliability. Those scales subsume aspects which are more difficult to examine in nursing (i.e. automatisation); nevertheless, these aspects are worth to be analysed within psychological work analysis in nursing. The results of reliability estimation have been confirmed by another study in 1996 with a total sample of 474 nurses from three general hospitals.

Different indicators can serve to inspect the validity of the TAA-KH-S. First of all content validity has been assured by a systematic participation of experts during the development of the instrument. Construct validity has been examined by means of a factor analysis of scales, cluster analysis of sections, domains and the entire instrument as well as by an inspection of intercorrelation within and between domains and sections. Main results can be summarised as follows: 44 scales are one-factorial according to the results of principal component analyses, 7 scales show second factors with little variance whereas 11 scales are multi-factorial. The multi-factorial structures of these scales are justified by content and can be well-interpreted in all cases. Results of the cluster analyses reflect a clear separation between the domains measuring job demands, work stressors and resources at an acceptable level of similarity which underlines the intended construction of the instrument. Intercorrelation matrices prove the necessary independence of domains and sections with sufficient unique variance for the sections. Furthermore, results of an analysis of convergent and divergent validity (correlation with construct-near respectively construct-distant measures like job satisfaction, psychosomatic complaints, burnout) show the expected sign of correlation coefficients as well as a sufficient and significant strength of most of the correlations between the scales of the TAA-KH-S and the criteria for convergent and divergent validation.

Both, reliability and validity of the Task Analysis method were examined (see Glaser, 1997). In order to provide for interrater-reliability all task analyses were performed by two
experts (raters). There are different models for testing interrater-reliability which can be distinguished according to their strictness. If a work task (and not a person) is the object of analysis only differences between the work tasks create true variance, all other influences must be considered as measurement error. In other words, in addition to the inaccuracy of the instrument, differences between investigators as well as differences between the job occupants are potential sources of error variance in reliability estimation (see Greiner & Leitner, 1989).

Therefore, we used the Model of Double-Analysis (see figure 4, Oesterreich, 1992) as a method of reliability estimation. Double-analysis is the method with the highest degree of strictness in estimating reliability of observational methods like task analysis, because the effects of different investigators as well as effects of different nurses are considered. In addition our model of double-analysis embraces the effect of time, since complete shift observations of two raters are performed at different working days and different working times. By choosing different working days and working times for observation one is able to control for effects of time. Moreover, because we know that early shifts are different from late shifts in many aspects of nursing tasks it was necessary to enlarge the information basis by collecting data from two experts.

The results of interrater-reliability indicate a sufficient reliability standard of the Task Analysis. The overall concordance rate of the expert ratings concerning regulation demands is 69% - a result which is quite satisfactory considering the high degree of strictness of the underlying estimation model. Regulation problems which have been rated by external observers as well as by the nurses (within the TAA-KH-S) show a Spearman correlation coefficient of \( r = .73 \).

In addition, the reliability of the Inventory of Work Functions subsuming 43 categories and 262 different work functions is estimated by the internal consistency of the 43 categories. 33 categories show good reliability coefficients (\( \alpha \)) of above .80, six reach satisfying reliability with values of above .70 and two categories with \( \alpha \geq .60 \) can be regarded as sufficient reliable. Only two of the work function categories show insufficient reliability with an \( \alpha \) below .60.
Figure 4: The model of double-analysis in nursing

The Organisation Diagnosis has not yet been examined with respect to its reliability. Objectivity of the instrument is given because all parts of the manual are full- or at least half-standardised.

Application of the TAA-KH

The modules of the TAA-KH not only differ with respect to the underlying concepts - within the common theoretical framework - but also with regard to the methodology and methods of data collection.

The TAA-KH-S is a questionnaire subsuming statements about work characteristics and working conditions. All items of the five domains of the self-report version TAA-KH-S are phrased in a condition-oriented way (i.e. "One has to ..." or "At this ward..."); the items have to be rated on a five point Likert scale ranging from 1 "not at all" to 5 "yes indeed". The overall amount of time to answer the questionnaire averaged at about 45 minutes. A handbook
gives further information for the evaluation and interpretation of the data and provides norms and profiles (see Büsing & Glaser, 1999b).

Before applying the Task Analysis the aforementioned **Inventory of Work Functions** is administered to a representative sample of the nurses of the ward in form of a questionnaire. Nurses are asked to describe the frequency of occurrence of the 262 different work functions on a 9-point frequency scale. It takes about 20 minutes of time to answer this questionnaire. The results are evaluated at ward level by averaging the scores of all nurses with respect to the work functions of each of the 43 categories. The resulting 43 means represent a typical profile of work activities in nursing at a specific ward. The profile serves as a screening device for the Task Analysis.

During a complete shift observation the main characteristics of a ward (i.e. staff, intensity of care, rooms, technical devices, material) are recorded for the purposes of **Task Analysis**. The focus of the shift observation is on regulation demands and regulation problems in nursing. For this objective the expert can use the manuals which contain theory-based algorithms and criteria for assessing regulation demands and problems. An interview with the observed nurse is following the shift observation; it provides additional information about the work processes, especially for the underlying psychological regulation processes on a ward since there are quite a few aspects of nursing which cannot easily be observed. The Task Analysis is rounded up by an additional interview with the ward nurse with respect to specific information about: co-operation on the ward, nursing system, working time, important organisational changes, etc. (see figure 4). A Task Analysis at a ward requires about 14 hours of time for the complete shift observation and the two interviews.

The **Organisation Diagnosis** is performed by means of a detailed half-standardised manual for interviewing managers and experts of the hospital including the heads of the three subsystems of nursing, medicine and administration. The interview manual for the organisation diagnosis comprises a catalogue of 31 topics. Each of these topics includes a variety of aspects which are formulated as standardised questions. The duration of an organisation diagnosis depends very much on the size of the hospital. For a smaller hospital with about 300 beds 40 hours of interview time with 6-8 experts is necessary in order to perform a comprehensive diagnosis of the organisational structures and processes.

The Work Analysis Instrument for Hospitals (TAA-KH) is structured in modules. This modular structure ensures that, firstly, the instrument is sufficiently broad and comprehensive. Secondly, there is no need for applying the total instrument, rather specific goals and objectives can be met with separate modules. Thirdly, additional other instruments and therefore specific aspects of a project or study can easily be integrated into an analysis with the TAA-KH. This modular structuring applies to both parts of the TAA-KH: the self-rating as well as
the expert rating version. Depending upon the purpose of a specific study components of the TAA-KH-S – e.g. parts of domain S.1 for assessing qualificational demands or parts of domains S.4 and S.5 for analysing work stressors - can be used. The Task Analysis is also suitable for a modular use. Which means that for specific purposes the complete shift observation can be reduced in content and time and that for other purposes, for example the evaluation of an organisational development in a hospital, it might be recommended to perform a sequence of (reduced) shift observations at different times of measurement.

5 Case Study: "Evaluation of the implementation of a holistic nursing system"

In one of our studies we evaluated the implementation of a holistic nursing system in a general hospital. At the beginning of the implementation the nursing system of this hospital could be characterised as a so-called functional nursing system, characterised by hierarchical structures, clear division of labour and subordination relationships (for an overview and criticism of functional nursing see Elkeles, 1997). On the ward level this hierarchical organisation is transformed into a functional or tayloristic work organisation. In functional nursing the ward nurse co-ordinates the relevant work processes by assigning working tasks and functions to the nurses. The nurses perform the working tasks in so-called "rounds". Within one round all patients on the ward are, for example, supplied with medicaments, which often have been prepared by another nurse during the preceding night. Here, nursing is highly functional because nursing tasks are divided among different nurses, each of them does not have sufficient overview of the working task as a whole. Nursing tasks in functional nursing systems are often incomplete since functions of planning or controlling are part of the task and duty of other staff members or professions (e.g. ward nurse, doctor).

An alternative to functional nursing is the so-called holistic nursing (see Büssing, 1997; Glaser & Büssing, 1996a; Dossey, Keegan, Guzzetta & Kolkmeier, 1995). A specific form of holistic nursing is "domain nursing" which means a sectorisation of the responsibilities of nurses into domains. In the German system of "domain nursing" each nurse has clear responsibilities for a small number of patients and works autonomously within “her” domain. Whereas functional nursing has often been criticised for its de-motivating influences on nurses and its low degree of patient orientation, holistic nursing provides a higher degree of demands and more autonomy with regard to nursing tasks. While functional nursing usually can be characterised by comparatively low job demands, many interruptions and incoherent nursing activities, holistic nursing is supposed to enable nurses to apply knowledge and skills due to higher job demands, more complete working tasks and enlarged autonomy.
Although the negative effects of functional nursing on working conditions and the quality of working life of the staff (work stress and dissatisfaction, fluctuation, turn-over etc.) is well-known and documented in many studies (e.g. Fagin 1982a/b; Irvine & Evans, 1995; Jones, 1996; Song et al., 1997) little is known about the specific task characteristics and organisational structures which are supposed to be responsible for the negative outcomes. In our study an evaluation of the redesign and re-organisation of the nursing system from functional to domain nursing did provide important information about the detrimental conditions of working systems in hospitals and nursing in particular.

For this purpose we used the TAA-KH as a valid instrument for analysis and evaluation because it meets the specific demands which emerge from the hospital as a socio-technical system with the nursing system in its centre. We performed a work analysis in this hospital by means of the TAA-KH before, at three times during and at one time after the implementation of the holistic nursing system. The results of our systematic evaluation were able to reveal many disadvantages of functional nursing with regard to economy of time, quality and errors, i.e. unnecessary long ways, process inherent delays, increasing co-ordination requirements, and higher error rates due to vague arrangements or deficient co-ordination. And, as an outcome a decrease in motivation and work satisfaction was found (cf. Büssing, Barkhausen, Glaser & Schmitt, 1998; for specific results e.g. Büssing & Glaser, 1999d; Büssing, Glaser & Herbig, 2000).

The evaluation of the reorganisation process in this hospital by means of the TAA-KH proved to be a very fruitful approach: Results gave evidence that the reorganisation of nursing processes decreased work load (e.g. regulation problems due to interruptions) to a considerably degree (significant changes between times of measurement) and increased the quality of working life of nurses (e.g. job satisfaction). Moreover, the reorganisation also improved the interface between nurses and patients with regard to the quality of service (see Büssing et al., 1997).

An important aspect of our study was the formative approach of the evaluation. According to the formative design the results of each evaluation phase were transferred (fed) back to the nurses by means of presentations, workshops and reports during the whole process of organisational development. Against the background of the detailed results of our evaluation unexpected (side) effects of organisational changes - like overtaxation of the employees due to increased job demands - could be corrected during the project, for example by specific training or workshops.
6 Work analysis in hospitals as a basis of evaluation and redesign: Remarks and outlook

A fruitful evaluation of work systems in hospitals depends on detailed analyses of goals, structures and processes of the work organisation as well as on the analysis of the interfaces between the hospital subsystems. Work activities within complex organisations cannot be regarded as isolated activities of individuals. They must rather be seen within their socio-technical context. An increase in regulation demands of one working task (e.g. nursing task) usually can only be accomplished by reducing job demands of other tasks in the organisational system (e.g. tasks of ward nurses, doctors). Restructuring processes have to be planned carefully; otherwise job enlargement and job enrichment on the one hand may be accompanied by job impoverishment on the other hand. Therefore, an integrated multi-level and multi-method analysis of work as operationalised with the TAA-KH is helpful for several reasons.

First, there is a considerable lack of theoretically derived instruments for work analysis in hospitals. The OTI-concept with its multi-level and multi-method approach and the action regulation theory provide an elaborate framework for the TAA-KH. Analysis and assessment on the basis of this instrument can therefore overcome these deficiencies. It can provide theory-based analytical information and knowledge about objective work conditions and their specific consequences in hospitals and particularly in nursing. And, because this information from analysis is theory-based and detailed it can serve as a valid input for evaluation and design.

Second, depending on the aims of work analysis in hospitals both, results from self-report measures as well as expert-rating methods may be important. The TAA-KH comprises both methods; they can be used in a modular way.

Third, the modular construction of TAA-KH with various methods at different levels against the same theoretical background has several methodological and practical advantages. One example is the possibility for an economic use of certain modules or combination of modules for specific purposes. These methodological advantages are closely connected with the common theoretical basis of the different methods which allows for a valid comparison between levels (e.g. work place, department) according to multi-level perspectives in organisational research (Rousseau, 1985). Another methodological advantage offers the chance to triangulate results by different methods of the TAA-KH which focus on the same object (e.g. Jick, 1983).

Fourth, an important point in work analysis is the problem of method variance. Method variance, usually defined as variance in observations due to the method rather than the trait of interest, is a potential source of serious bias in any measurement. This is also a particular
problem in organisational settings. Because self-reports of work characteristics and job conditions are typically used as indicators an inflation of the correlation with self-report outcome measures like well-being, strain, satisfaction and so forth is very likely due to shared method variance rather than relations between the variables of interest. A fairly common, however rarely applied approach to controlling sources of method variance, is to use reports of observers like experts. These additional measures can control sources of method variance to the degree of their independence from the observed worker (e.g. Frese & Zapf, 1988). “To solve the problem of the alternative source of job characteristics data being affected by characteristics of incumbents, one would have to select a method to minimize contact” (Spector & Brannick, 1995, p. 267). This is the case in applying the TAA-KH. Although the observers are familiar with hospitals, nursing and its organisation they do not have contact with the job holder except during the observational situation. Therefore, the chance that the observers knowledge of, for example, the job holders job satisfaction might distort the observers rating of job conditions is negligible. Another aspect in the construction of the TAA-KH which can prevent method variance is that the items of the self-report version are phrased in a condition-related way so that the overlap in content (Kasl, 1987) between work characteristics and subjective work outcomes can be minimised.

Fifth, all methods of the TAA-KH – including the observation methods used for task analysis – proved to be objective, reliable and valid. There are often instruments applied by hospital experts and consultants that have not been validated at all; and many of them are pure self-report measures. Redesign strategies grounded on such methods and their results are likely to fail in reality for several reasons. One is the circumstance that they can only provide vague and biased information. Another is the fact that they produce information about the work systems which is not very much work process-related and therefore hardly suitable for deriving specific design and intervention strategies. One should not be surprised if redesign strategies based on such analytical information do not reach the goal of designing and supporting efficient, stable and humane working systems.

Some future perspectives should finally be mentioned. First, we are developing a more economic version of the TAA-KH in order to raise its acceptance in practice. A screening version of the TAA-KH-S is intended to support experts in hospitals to analyse, document and improve the status of occupational health of the organisation. First experiences with this screening version of the TAA-KH-S are encouraging since the quality of measurement in terms of reliability and validity turns out to be sufficient (cf. Büssing, Glaser & Höge, 1999) and the results are sufficiently expressive for purposes of redesigning work in hospitals. Second, on the basis of the results collected with the TAA-KH we are developing a manual for work redesign in nursing. The aim of the manual is to introduce concepts from work
psychology as well as checklists for analysis and assessment of working conditions into hospitals. A first version of the manual was evaluated by hospital experts several times and was judged as a fruitful tool for gaining illustrative work psychologists' knowledge and applying it into practice. Third, we have developed a systemic concept of quality management in hospitals. The concept subsumes the perspective of employee orientation as well as the perspective of patient orientation against the common concept of holistic nursing. Patient orientation can be evaluated by our "Muenchen Instrument for Patient Surveys" (MIP) whereas employee orientation can be diagnosed by means of the TAA-KH. The combination of MIP and TAA-KH provides a suitable and comprehensive methodology for assessing quality (of services and of working life) in hospitals. A prototype of this integrated concept and methodology of quality management in hospitals is examined at the moment in cooperation with general hospitals.

References


