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### ETdA: a challenge in the future of ergonomics

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#### KEYWORDS

Client Profile, Decision-making, Ergonomic tridimensional analysis.

#### ABSTRACT

Ergonomic Tridimensional Analysis (ETdA) is a new ergonomic approach that makes possible the identification and description of several ergonomic contexts defined by common areas where professionals' activities are related with a clients or consumers' service provide or products sales. The ETdA ergonomic evaluation is made by three dimensions: Professionals, Analyst and Clients, using specific and suitable observation tools. A study based on three different common areas was performed in order to understand the use of the ETdA model and its importance in the ergonomics' future challenges. Results also allowed the critical ergonomic factors identification and the weighting table assembling leading to the ergonomic intervention.

#### INTRODUCTION

In human work activities, different ergonomic methodologies can be used to evaluate intrinsic (individual: work postures, general physical activity, communication/inter-relation and attentiveness) and extrinsic ergonomic factors (EF) (environmental: noise, lighting, thermal environment and risk accident or occupational: professional training quality, job content, decision making, restrictiveness) (Loureiro et al., 2010a), helping the activity characterization and identification of critical situations that need ergonomic intervention (MacLeod, 2003). The available literature in the field of ergonomics provides an identification and description of several ergonomic contexts that comprise the

professional workplace. According to the complexity of the task and its level of automation and to the professionals' interrelation with management and clients, a dynamic environment can be defined (Cellier et al., 1997). In these environments, the total quality management philosophy is focused not only in workforce satisfaction, but also in clients' satisfaction, since in modern social-technical systems they are intrinsically linked to the organizations. Therefore, processes of improvements are often multidimensional (considering all the organizational participants), cross and serially correlated (Jarrett & Pan, 2007). Due to that, the client becomes an important participant and their opinion relevant in the ergonomic analysis.

#### PROCESS AND RESULTS DISCUSSION

The Ergonomic Tridimensional Analysis (ETdA) was developed to be used as an auxiliary tool on the ergonomic analysis and intervention in common areas, that is the diagnosis of the studied conditions and identification of the critical EFs and consequent adjustments represent the ergonomic intervention. ETdA is a new ergonomic approach that presents a realistic (in occupational and usability terms) overview of these areas. In fact, professionals' activities are related with a clients or consumers' service provide or products sales, providing a human interaction. Although the ETdA model was initially designed for commercial areas with free circulation of people, currently new applications are being tested, namely on the health sector where common areas were identified. Professionals, Analyst and Clients, are the ETdA dimensions. For each of these dimensions, specific observation tools were assembled: an evaluation form and a checklist for direct and indirect observations and



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ETdA questionnaire. The questionnaire was pre-tested to be used in the survey and the results of validation (sensitivity, validity and reliability) contributed for its improvement (Hedlund et al., 2010; Loureiro et al., 2010b). The set of 14 EFs is flexible, and it can be chosen according to the area under analysis. Considering the ETdA dimensions, they can be submitted to different processing's, reproducing variables that can be analysed ensemble, the ETdA variables. According to the ETdA dimension, they are named Ae variables in analyst dimension or Pe variables in the professional dimension. In clients' dimension two different variables are identified according to the number of ergonomic questions used to identify the EF: Ce variables or temporary (Tv). In this specific case, a combined analysis must be done, in order to obtain a single classification of the EF. A model framework was developed to study the defined ergonomic variables: supplementary, temporary and ETDA variables. With this procedure, three dimensions are characterized, allowing the dimensions' profile definition. With the defined profiles and the different answer categories, several correlations can be studied. Standard residuals procedure can be use to increase the meaningful of the obtained results. Through a multivariate analysis an inter and intra dimension analysis of the ergonomic factors' correlations is then made. This procedure is important to a tridimensional assembling matrix, helping the analyst in the results' weighting and decision make to the ergonomic intervention.

In order to understand the impact of the ETdA model in the ergonomic analysis; a case study was performed on three different stores, namely a wholesale retailer, entertainment retail chain and a sports store. Observation tools' results first level analysis allowed the critical ergonomic factors identification in the wholesale retailer: Thermal environment, Noise, Postures and movements and Lifting. The obtained weighting table shows differences between the three ETdA dimensions evaluations. There is an agreement between clients and analyst dimensions in the thermal

environment evaluation. The weighting results for the postures and movements EF are equal. Both professionals and analyst dimensions have the same evaluation for the lifting EF. Considering the noise EF, different weighting results are obtained. Clients' ergonomic evaluation will reproduce organizational adjustments, which will also benefit the professionals' ergonomic context, facilitating the ergonomic intervention.

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