



ETdA for commercial area with free circulation of people: a sustainable model?

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The Ergonomic Tridimensional Analysis, ETdA, is a new approaching in Ergonomics. It is a continuous model that assists the ergonomist (Analyst) in his ergonomic analysis leading to a priorities list establishment. The diagnosis of the studied conditions and the consequent adjustments represent the ergonomic intervention. This model was developed to be used in commercial areas with free circulation of people. In fact, the emergence of these areas represents a new social-technical system (Querelle and Thibault 2007) where clients are assuming a vital role (Loureiro et al. 2010a). In such contexts, the clients command the corporation destiny, supporting the top management strategies and stretching the different organization hierarchies (Lindon et al. 2000) and become intrinsically linked to the organizations (Taveira et al. 2003). The ergonomic factors that allow the ETdA operability are intrinsically, or extrinsically, linked to the professional, being respectively considered as environmental or occupational. If they are inserted in the organizational schemes of the social-technical systems it will be occupational, otherwise, environmental, when related to the non-occupational contexts (Loureiro et al. 2008) (Table 1).

Table 1:ETdA ergonomic factors

Environment	Occupational	Personals
Noise	Professional training quality	Work postures
Illumination	Decision making	General physical activity
Thermal environment	Restrictiveness	Communication/inter-relation
Risk accident	Job content	Attentiveness
	Work space dimensions	

The proper study of the ergonomic factors in a tridimensional perception will assess the risk situations in commercial areas with free circulation of people and make easy the ergonomic intervention.

In this new ergonomic context a multiplicity of relationship were identified and characterized. From the ETdA point of view, it is necessary to

understand all the mechanisms that regulate these relationships because they can contribute to the business improvement strategies (Loureiro et. al 2010b). The relationships identified were: Analyst/Professionals (AP), Analyst/Clients (AC), Clients/Professionals (CP) and Management/Clients/Analyst (MCA). From the economics point of view, the existence of a CP relationship is very important since its success can determine a sales profits improvement for the organization. The ETdA model defined this relationship as bilateral, because it is a trust relation based on a multilevel interaction, professional skills, professional training, mutual empathy and understanding. It is also important to consider that the agreement in clients and professionals ergonomic analysis has more impact in the ergonomic intervention. The AP relationship usually considered in the traditional ergonomic analysis is essentially occupational and focused in workplace environments, so they become insufficient for commercial areas with free circulation of people, where clients' dimension is also considered. This is also a bilateral relationship but less effective than the first one. The AC relationship is identified as unilateral, since there is no physical interaction between those two dimensions. However, it is important to emphasize that the benefits of the ergonomic intervention proposed by the analyst will bring improvements in the commercial area, thus clients will also get benefits from that intervention. The main issue of the management of the new social-technical systems is the clients' individual satisfaction requirements. Therefore, it is necessary to make some adjustments in the organizational framework; utility, functionality, environmental adjustment, aesthetics, prestige, usability and pleasure (Staton et al. 2005; Ziliani and Bellini 2004). This clients' dimension oncoming to the management organization facilitates the ergonomic intervention, creating co-responsibility in the changes to be implemented (Dzissah et al. 2005).

The first step of ETdA model application is the contact between the analyst and the management of the organizations under study. This is a very



important issue of the ETdA application and encourages the participation of the entire organization in the success of the process; consequently professionals must also be aware of all the ETdA steps. The second step of this ergonomic approaching is the application of the ETdA observation tools (Table 2).

Table 2: ETdA observation tools'

Dimension	Observation tool
Clients	Questionnaire
Professionals	Evaluation forms
Analyst	Direct and indirect observation

The evaluation forms and the analyst direct and indirect follow the methodology used in the Ergonomic Workplace Analysis (Ahonen et al. 1980). However, some adjustments were made in the professionals' observation tools, namely the main improved aspect was the establishment of a unique classification scale where the answer set categories' vary in ascending order, according to the seriousness of the situation: very good, good, bad and very bad. A questionnaire was also developed for the clients' dimension. It is a direct administration tool, which presents, as a main advantage, the possibility of quantification of a variety of data and consequent establishment of multiple correlations. The questionnaire validation results (sensitivity, validity and reliability) contributed for its own improvement. The most important one was the categorization of all the answers in one single version. This adjustment contributes for a better results' understanding. It is important to refer that the questionnaire validation was a significant step of this observation tool development, essentially because it is a questionnaire with a lower number of questions.

The final ETdA task is the statistical treatment of the three dimensions and formulation of the priority list of changes to be implemented, named the weighting table. It is authors' belief that the three dimensions results should not be a equally weighted. The weighting of all the dimensions is a more reliable process of diagnosis of the commercial area in study, facilitating the ergonomic intervention.

The sustainability of ETdA model is manifest in its realistic overview of the real work in commercial areas with free circulation of people. Indeed, these areas are scenarios for different actors, and each one should be aware of the importance of ergonomic issues in modern society. ETdA model can also be seen as a model that will increase the population awareness for

ergonomics, leading to co-production responsibility in society and in modern socio-technical systems.

REFERENCES

- Ahonen, M.; R. Limarinen; I. Kuorinka; M. Launis; J. Lehtelä; T. Leskinen; T. Luopajarvi; J. Saari; P. Seppälä; and H. Stålhammar. 1989. *Ergonomic Workplace Analysis*, Ergonomics Section Finnish Institute of Occupational Health.
- Dzissah J.S.; W. Karwowski; J. Rieger; and D. Stewart. 2005. "Measurement of management efforts with respect to integration of quality, safety, and ergonomics issues in manufacturing industry", *Human Factors and Ergonomics in Manufacturing* 15 (2), 213-232.
- Lindon, D.; J. Lendrevie; J. Rodrigues; and P. Dionisio. 2000. *Mercator XXI: Teoria e Prática do Marketing*, Publicações D. Quixote, Lisboa.
- Loureiro, I.; C.P. Leão; and P.M. Arezes. 2008. "Desenvolvimento de um Modelo de Análise Ergonómica: impacto da população utilizadora na Análise". In *Proceedings of the SHO2008 International Symposium* (Guimarães, Portugal, Fev) Arezes et al. (Eds.), 179-182.
- Loureiro, I.; C.P. Leão; and P.M. Arezes. 2010a. "Management of the Benefits on the Client's Involvement on Ergonomic Analysis". In *Communications in Computer and Information Science* 92, Tenreiro de Magalhães et al. (Eds.), 1-8.
- Loureiro, I., C.P. Leão; and P.M. Arezes. 2010b. "Tabela de ponderação: construção de uma metodologia para intervenção ergonómica", In *Proceedings of the SHO2010 International Symposium* (Guimarães, Portugal, Fev) Arezes et al. (Eds.), 299-303.
- Querelle, L.; and J.F. Thibault. 2007. "The practice of the ergonomist consultant: a reflexive tools-based approach", *@ctivités*, 4 (1), 160-169.
- Staton, N.; A. Hedge; K. Brookhuis; E. Salas; and H. Hendrick. 2005. *Handbook of Human Factors and Ergonomics Methods*, John Wiley & Sons, USA.
- Taveira, A.D.; C.A. James; K. Ben-Tzion; and F. Sinfort. 2003. "Quality management and the work environment: an empirical investigation in a public sector organization", *Applied Ergonomics* 34, 281-291.
- Ziliani C.; and S. Bellini. 2004. "Retail Micro-Marketing Strategies and Competition", *The International Review of Retail, Distribution and Consumer Research* 14 (1), 7-18.

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