

APPLICATION OF THE OPEN METHOD (MD3E) IN THE ERGONOMIC DESIGN OF PRODUCTS

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ABSTRACT

According to Ferreira et al (2003), the activity of developing products takes on a prominent posture in the corporate world, constituting an important factor of competition. In order to carry out a product design a method should be applied to promote safety and increase the chances of success. In this article, two standards of methodologies will be discussed: open and closed. Initially, closed methods focused on Ergonomics will be presented. Later on, there is a differentiation on the open and closed methods, through the exposure of the open Method of Deployment in 3 Stages (MD3E) and its application in the field of Ergonomics. On dealing with an open method, the user can intervene in its stages to adapt them to their work, once it is not configured as a ready-made model. Bibliographical and field researches were used to achieve the end results of this research project.

KEY WORDS

Methodology, Human Factors, Design, Open Method

1. INTRODUCTION

The evolution of the methods of Design is an important field of study in Design. Due to the impact of new demands on the market and new technologies of Design, it is essential to adapt it to the needs of society in general so that the development of Design may occur more efficiently.

Traditionally, ergonomics used the closed methods for the development of its interventions in the area of Industrial Design. This type of method is composed of a logical sequence of activities to be developed, clearly comprising the beginning, middle and end; in which a predefined space that needs alterations and interferences is not perceived.

Now in an open method the non-existence of fixed sequential norms, gives the project designer more freedom to ordain the activities that should be followed during the project (Santos, 2005). This model of method, when combined to the traditional processes of Ergonomics, can produce more consistent results from the perspective of Design, improving the quality of the process and increasing the chances of obtaining an end result with equally superior quality.

Thus, this research intends to validate the application of the open method concept in the area of Ergonomics and, for such, has developed a state-of-art study in methods of Ergonomic Design, a confrontation of the closed method *versus* open method concepts and, finally, applied the model of open method in the practice of design in the disciplines of Ergonomics in courses of Industrial

Design. The methodology used for the development of this research was the employment of two forms of research, defined by Marconi and Lakatos (2003): bibliography and field research.

According to Medeiros (1996), “a process of structured, capable and systematic Design is the key factor towards the successful development of a product, increasing the chances of success in the market”. Thus, the current methods should meet the needs of the demand of integration, flexibility and multi-disciplinarity and present configurations and paths to be followed, with an adaptable structure.

Therefore, the methodology will facilitate the integration of the areas of knowledge on the development of the project and will improve the development of several focuses that complement themselves, adapting more easily to the various realities of designs. This way, the importance of an open method being tested in a specific science of product development becomes apparent, which in this case is Ergonomics.

2. SYNTHESIS AND ANALYSIS OF THE BIBLIOGRAPHICAL RESEARCH

According to Ogliari (1999), the process of product Design constitutes a set of activities, procedures and rules that should be followed and applied systematically, from the definition of the problem of Design to the detailed solution of the product, performed in a multi-disciplinary manner. This structure is found in methods focused on Design, and in those presenting a much closer focus on the field of Ergonomics.

The theoretical foundation on which the concept of open method (MD3E – Method of Deployment in 3 Stages) was developed is presented by Santos (2005). The main difference is that the methods considered as closed present a structure with clear beginning, middle and end, without neglecting the spaces for interferences and adaptations in the methods, even though most of the authors admit that these adaptations are possible and even desirable, as long as they do not go against the logic of Design, defined by the consolidated experience and theories on Design (Munari, 2002).

By contrast, the open method supplies a conceptual base on which the Design should be developed, i.e. instead of a ready-made model, the MD3E indicates the various starting points possible, their minimum deployments (to ensure the processing quality), but obliges the project designer to build and interact permanently in the definition of subsequent stages, allowing not only the definition of what must be done, but also how to do it. Based on three basic stages: pre-conception, conception and post-conception the MD3E is deployed into several activities to be developed until the project is completed, passing through management and documentation, two activities that should permeate the entire work. However, the project designer must choose the auxiliary deployments according to his/her needs.

For each basic stage, a set of minimum deployments is determined to guide the beginning of the project. These minimum deployments are activities that should be carried out so that each stage can be developed. It is important to note that the interferences in the method can already happen from the minimum deployments, expanding or altering them according to the specific needs of each project, as show in figure 1.

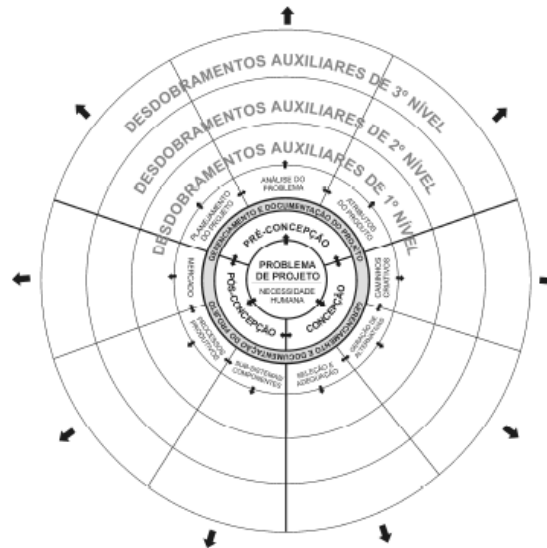


Figure 1 – Graphic representation of the open method MD3E. Source: Santos (2005)

As per the minimum compulsory deployments, the auxiliary deployments will be developed, which may have several levels. These deployments will describe the activities to be developed, and even in detail. Associated to the educational context, the open method is more adequate in the teaching-learning process, because it encourages the collective building of knowledge instead of applying ready-made formulas, based on the Social Theory of Learning (Wenger, 1998), as appointed by Costa (2003).

The practical application of the MD3E in the work developed by Santos (2005) was made in disciplines of Design in courses of Industrial Design, where random groups of students developed the Design practice applying closed traditional models and others applied the MD3E. The latter students obtained processing and product results superior to those using traditional structures. These results also resulted in higher marks obtained by the students who applied the open method.

On proposing the application of the concept of the open method in the reality of Design in Ergonomics, it is important to study the structures of the methods currently proposed for this activity. For such, an analysis was made of the methods of Design in Ergonomics proposed by Moraes and Mont'Alvão (1998), Itiro lida (2003), Vidal (1999), Cybis (2001), Jul and Weerdmeester (2004) and Gontijo (apud Silva, 1995). The selection of these authors was made based on criteria that allowed a wider approach of the methodological proposals for the activity of design in Ergonomics, selecting those most commonly referenced in the area of teaching Design, the focus of this research.

After the study of the related methods, it was verified that there are distinct structures, indicating phases, stages and sequences in a differentiated manner. However, these phases are similar among the authors, and may be simplified as: feasibility study (objective, problem of Design), conceptual Design (data collection), preliminary project (alternative solutions) and detailed project (after tests are performed, the proposal of the final solution). What basically differs is the form in which the proposals are structured, whereby the methods are presented as closed models, without the indication of opportunities of intervention by the project designers.

By carrying out bibliographical research, the need for a differentiated method is perceived for the development of products with emphasis on ergonomics that allow greater intervention among the

players involved, favoring the integration of the distinct areas of knowledge on the development of the project, without bringing in its essence any pre-established focus. On the contrary, its structure should facilitate the development of diverse focuses that complement each other to meet the diversity of situations in which Ergonomics intervenes.

3. APPLICATION OF THE OPEN METHOD IN THE ERGONOMIC DESIGN OF PRODUCTS

The experiment was made using the same methodology proposed and validated by Santos (2005), but instead of applying the open method in disciplines of Design, the application was made in disciplines of Ergonomics of courses of Industrial Design in Santa Catarina, during exercises of ergonomic design of products. The participating academics were divided into groups, some using the open method MD3E (test group) and others using the closed method (control group). The professors involved also participated in the assessment of the experiment.

The students developed projects for the improvement of the environment of canteens contained in the university campuses. The objective was to improve the ergonomic aspects through flowchart studies, environmental data and furniture arrangement – for this last item the students projected tables and chairs that best adapted to the needs of users, using closed methods and the open methods (MD3E) of Design.

For the assessment of the results, an enquiry was made with open and closed questions focused on both publics: professors and students, as proposed by Santos (2005). The questionnaires were to assess how the people involved perceived the performance of the open method in relation to the various questions. Among them, the contribution and understanding of the open method for the development of the project; making a comparison between the closed methods; an analysis of the integration of the open method with other methods and tools of Design, besides the contribution of the open method increasing the quality of the teaching-learning process.

The first two questions are related to the contribution of the MD3E in the development of the project and its performance, always making comparisons with other closed methods already used by the students. The students classified the contribution and performance of the open method as very important and important, thereby perceiving an acceptance of the method by the students and its contribution towards learning, a similar assessment as the one made by the professors.

Questions three to five refer to the stages of the MD3E and the form in which they are deployed, assessing the understanding of the terminology used and the need to insert more deployments or remove some of them. Comparing them with the other methods already used previously, the students consider the terminology employed as easy to understand, and most of them assess the deployments as necessary, but depend on the intervention of the user, because each stage can assist the creation of a product in a differentiated manner. They also assessed as sufficient the initial deployments of the project without needing to add new deployments (minimum deployments that accompany the basic structure of the MD3E).

The following questions refer to the experience of interfering in the structure of the method, deploying its stages at higher or lower level. Most of the professors and students revealed that they interfere in the structure of the method, because, according to them, there are certain moments in which the methodology does not fit in with the need of the project. Thus, the need of a method becomes flexible, allowing interferences and adaptations to be made to its structure. When questioned about the experience of using the open method in the ergonomic design of products, the absolute majority of the responding students confirmed they would go back to using the open method in exercises of Design, confirming its acceptance, as shown in figure 2.

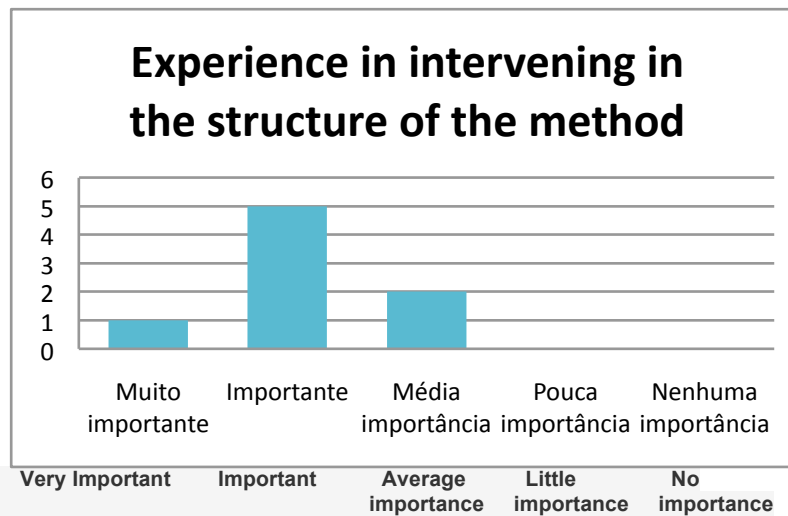


Figure 2 – Graph about the user’s experience in interfering in the structure of the methodology, under the student’s perspective.

The results presented by the teams that used the MD3E were, on average, superior to the results of the other teams, based on the assessment of the professor. This assessment is graded in marks from 0 to 10, whereby the groups who used the MD3E obtained an average assessment of 7.3 against the other teams of design that used closed methods and obtained an average assessment of 6.8. Of the seven teams monitored, one used the MD3E and got a 10 in the project, being the only one to achieve the top mark.

It was observed that some of the teams that used closed methodologies employed little of the method chosen in the development of the project, i.e. they were just a theoretical referential required by the professor and a compulsory element of the end report, but they were not an effective part of the development of the projects. The teams that obtained the highest marks confirmed their use of the open method together with other tools of Design, showing better commitment in carrying out the project, with more discussion about the project and more concern about the results.

5. CONCLUSIONS

Based on the results obtained, it was considered that the MD3E can be used in the area of field work in Ergonomics efficiently, and may be combined with other existing methods or adapted to the specific needs of each project, presenting a result superior to the methods traditionally applied.

Two of the three teams that obtained the best assessment used the open methodology, however, one of the lowest marks was of another group that, also applied the MD3E, but did not do the necessary deployments and interferences for its application, using it as though it was a traditional method. It is concluded, therefore, that the MD3E needs a more mature and interactive posture on the part of professors and students, maybe not recommended for the initial exercises of Design, both in the disciplines of Ergonomics and in the practice of Design, as verified in a previous research made.

Even with this consideration, the methodology proved to be appropriate for use in exercises of Design focused on Ergonomics, mainly when combined with other closed methods, resulting in a process of Design with more quality and, consequently, better designed products. It is believed

that the application of the MD3E in Ergonomics may bring better results than the closed methods, however, it depends on the commitment of its users in doing interventions in order to present better results, whereby its use is widely accepted both by professors and students. Based on this rationale, we intend to give continuity to the experimentation of the open method in other realities of Design to observe the comprehensiveness of applications.

6. REFERENCES

- COSTA, C.M.O.N.G. Design de faz... aprendendo! In: 20 CIPD – Congresso Internacional de Pesquisa em Design. *Anais eletrônicos em CD-ROM*. Rio de Janeiro: Outubro de 2003.
- CYBIS, Walter. A. *Critérios ergonômicos para avaliação de interfaces homem-computador*. Available on <<http://www.labutil.inf.ufsc.br>>. Accessed on 20/05/2011.
- DUL, Jan. *Ergonomia prática*. 2. ed. rev. e atual. São Paulo, SP: Edgard Blucher, 2004.
- GOMES, João F. *Ergonomia do Objeto: sistema técnico de leitura ergonômica*. 2ª Ed. São Paulo: Escritura Editora, 2010.
- IIDA, Itiro. *Ergonomia: Projeto e Produção*. São Paulo: Edgard Blucher. 2003.
- MARCONI, Marina de Andrade; LAKATOS, Eva Maria. *Fundamentos de metodologia científica*. 5. ed. São Paulo, SP: Atlas, 2003.
- MEDEIROS, Estevão Neiva de. *Análise de aspectos do gerenciamento do design em processos de modernização tecnológica sob enfoque ergonômico*. 1995. Tese (Doutorado em Engenharia de Produção) – Programa de Engenharia de Produção, COPPE/UFRJ, Rio de Janeiro, 1995.
- MORAES, Anamaria de; MONT'ALVÃO, Cláudia. *Ergonomia: conceitos e aplicações*. Rio de Janeiro, RJ: 2AB, 1998.
- MUNARI, Bruno. *Das coisas nascem as coisas*. São Paulo: Martins Fontes, 2002.
- OGLIARI, A. *Sistematização da Concepção de Produtos Auxiliado por Computador com Aplicações no Domínio de Componentes de Plástico Injetado*. Florianópolis. SC. PPGEM. UFSC. 1999. Tese.
- SANTOS, Flavio Anthero dos. *O design como diferencial competitivo: o processo de design desenvolvido sob o enfoque da qualidade e da gestão estratégica*. Itajaí: Universidade do Vale do Itajaí, 2000.
- SANTOS, Flávio A.N.V. dos. *MD3E (Método de Desdobramento em 3 Etapas): uma proposta de método aberto de projeto para uso no ensino de Design Industrial*. 2005. Tese (Doutorado em Engenharia de Produção) – Programa de Engenharia de Produção e Sistemas, UFSC, Florianópolis, 2005.
- VIDAL, Mario Cesar. *Introdução à ergonomia*. Rio de Janeiro, RJ: COPPE. Available on <[http://www.ergonomia.ufpr.br/Introducao%20a%20Ergonomia %20Vidal%20CESERG.pdf](http://www.ergonomia.ufpr.br/Introducao%20a%20Ergonomia%20Vidal%20CESERG.pdf)>. Accessed on 18/05/2011.
- WENGER, Etienne. *Communities of practice: learning, meaning and identity*. Cambridge: Cambridge University Press, 1998.