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CONSTRUCTION OF EXPERIENCE, A PROPOSAL FOR THINKING ABOUT PROJECT WORK ACTIVITY.

João Marcos Bittencourt
Programa de Engenharia de Produção, COPPE
Universidade Federal do Rio de Janeiro
Email: jmarcos@pep.ufrj.br

Francisco José de Castro Moura Duarte
Programa de Engenharia de Produção COPPE
Universidade Federal do Rio de Janeiro
Email: duarte@pep.ufrj.br

Pascal Béguin
Universidade Lyon Lumière Lyon 2Centro Max Weber
Email: pascal.beguin@univ-lyon2.fr

Abstract: The action of the ergonomist in workspace projects can be understood within three different approaches: crystallization, plasticity and development. While the first two already have well-established approaches and approaches, there are still a lack of methods and concepts to work within a development approach. This work aims to propose the concept of experience construction as an engine for the development of solutions for workspace projects within the development approach. A case study was carried out of the transfer of a complex of biotechnology laboratories to a new building. The data were collected from analyzes of the activity of the researchers, in addition to analysis of recordings of the project discussions using a lay model made to represent the solutions for the workspaces. Two examples of elaboration of design solutions are presented that demonstrate the process of building the experience in the development of solutions for the design of workspaces. The construction of experience is presented as a non-teleological process in which the future work activity and the organization of the work spaces are articulated in a dialogical way.

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Keywords: ergonomist, workspace, biotechnology, laboratory complex

1. INTRODUCTION

Béguin (2007, 2010) presents us with three different approaches to understanding the ergonomist's action and the value of the activity during the project: crystallization, plasticity and development. While the first two presuppose the construction of a model of the activity as a reference for design solutions, the third approach assumes that the activity develops over time and these transformations must be addressed in workspace projects.

Several of the methods used in ergonomics are focused on crystallization and plasticity approaches. We can highlight among these works the future activity approach developed by Daniellou (1992, 2007) and the simulation method (Maline, 1994). These approaches have generated positive results in recent years, however, they provide us with a limited response. Work from the instrumental approach (Rabardel, 1995, Rabardel & Béguin, 2005, Béguin, 2003) shows us that work activity develops over time, so that an initial modeling made of future work activity can become outdated when the work space work begins to be appropriate over time. One way of understanding this limitation is that these are approaches based on anticipation, however, future activity cannot be anticipated, especially if we are based on past work references (Bittencourt, 2014).

The challenge of development is to provoke evolutions in the activity during the project to develop work and work systems in a dialogical way (Béguin, 2008). It's about thinking about work on a basis other than anticipation. But there is still a lack of conceptual bases to analyze the development of the activity during the project. In this work, the concept of building experience will be proposed to guide the ergonomist's action in a project within the development approach.

The proposal for building the experience has three basic ideas. The first idea is that understanding

The experience used is based on the work of Dewey (2010). From this perspective, experience is not a simple accumulation of memories of different individual experiences. Experience is the product of the transformation of individuals' perception and skills. During work activity (Daniellou, 2005), individuals mobilize their knowledge and skills to deal with the different variabilities (Wisner, 1995) that arise in work situations. The difficulties encountered demand the construction of new responses, as described in the expression "dialogue with the situation" by Schön (1983). These responses also transform the perception and competence of individuals during work situations, similar to the experience of full experiences described by Dewey (2010).

The second idea is that the construction of the experience discussed here does not refer to the experience that is constructed individually in past work situations, but what is elaborated in relation to experiences that could be experienced in the future. In the context of participatory projects, we have the opportunity to bring together different professionals to discuss project solutions. However, when workers reflect on project solutions, these formulations are always associated with what their work would be like in the proposed situation. The construction of experience will be demonstrated as an articulated development between project solutions and ways of carrying out activities. It is about developing new ways of organizing the workspace, but also of getting work done.

The third idea is that the construction of experience is an essentially non-teleological process. Teleological action advocates a search for preconceived ends to which actions are mobilized (Joas, 2005). Characterizing the construction of experience as a non-teleological process means that the objectives of actions are reformulated during their implementation. This perspective allows you to build knowledge about the

work used to call into question the design objectives and better understand the project itself.

2. METHOD

A case study was carried out during the development of the project for a new biotechnology laboratory complex in a French state-owned company. The new complex would bring together four teams from one department, totaling

22 laboratories, as well as common areas such as a cafeteria, offices and bathrooms. Between the laboratories, there are shared spaces with equipment for common use among the department's teams; and each team's main laboratory with specific equipment and where each researcher has their own fixed bench.

An ergonomist, including one of the authors of this text, was hired to carry out an approach and participate in the project, so that future laboratory workers were integrated in the development of solutions for their workspaces. The results presented in this work were collected based on analysis of video recordings during the use of the model and interviews carried out with some participants to discuss the development of some solutions. The objective of the study was to analyze how workers mobilized their work experiences in developing new solutions.

The method for organizing workers' participation in the project was simulation (Maline, 1994; Béguin & Weill-Fassina, 1997), which is a recurring strategy in ergonomics used in projects. The ergonomist used a model made of Lego as a support to represent work situations. Lego as a model construction material had already been used in the same company in a previous experience reported by Turchiarelli et al., (2012) and was chosen as material for the model because it allows

construction of flexible structures, that is, that can be easily changed and changed locations (e.g. moving walls). Lego pieces also feature blocks with different colors, allowing you to create differences that make it easier to identify the elements of the model (e.g. white walls, beige benches and equipment with colors similar to the real ones). The use of the model was organized in two cycles, the first consisting of a meeting with each of the teams to discuss only the main laboratories; and the second cycle consisting of two meetings to discuss the entire complex with representatives from the four teams.

3 RESULTS AND DISCUSSION

In this item, two examples of the development of workspace proposals will be presented using the model as support.

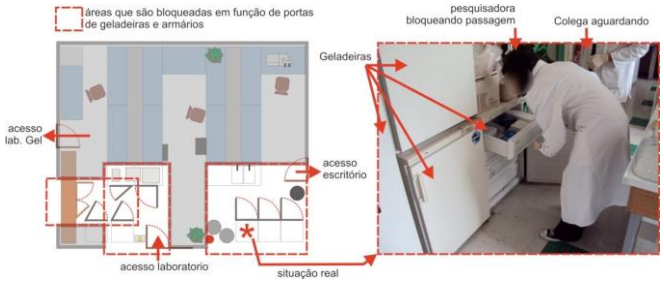
3.1 Expression of an experience that could be lived

One of the characteristics of the teams' main laboratories was the presence of several refrigerators, used to store various materials such as reagents, samples and chemicals. These products could be stored for daily use or stored for years. In the main laboratory of one of the four teams involved in the project, the presence of a large number of refrigerators caused a problem with movement in space.

This laboratory was used by the smallest team in the department: 5 researchers; however, in this work space there were 12 pieces of refrigeration equipment including refrigerators, refrigerators and minibars (60cm tall refrigerators). In the laboratory studied during the project period, these refrigerators were concentrated in the central corridor of the laboratory. Whenever a

researcher opened one of them to look for a material, the passage to the laboratory was blocked (Figure 1). Furthermore, as there was no standard use of refrigerators other than differentiation by cooling power, it was not uncommon for a researcher to need to look in more than one refrigerator to find a desired material. This situation was characterized by the team during the simulation meeting as irritating to everyday life in the laboratory, and they decided that this was a problem that could not be reproduced.

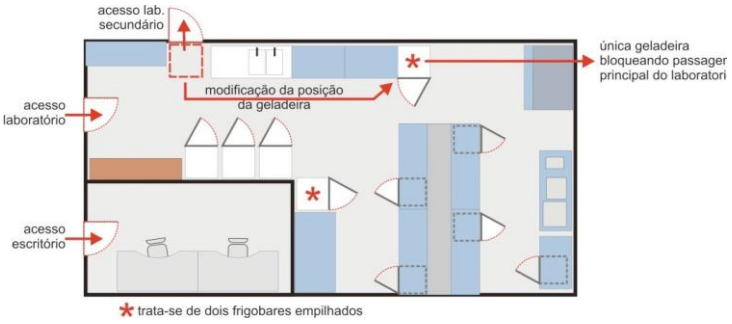
Figure 1 - laboratory passage blocked by a researcher looking for something in the refrigerator



To deal with this situation, the team decided to create a distribution pattern for refrigerators within the laboratory. Firstly, beneath each nominal bench there would be a minibar intended for a researcher. This way, each researcher could organize their refrigerated space as they saw fit and would not need to block their colleagues' passage to find something. To make this possible, a countertop pattern was selected from those available with a larger span, so that the refrigerator did not take up leg space. This would be one way to deal with part of the problem, but there were still seven other larger refrigerators to be positioned.

Shared-use refrigerators were placed in the laboratory's access corridor. To prevent opening these refrigerators from reproducing the old problem, it was found that the width of the corridor was sufficient to enter or leave the laboratory while a colleague was looking for some frozen material. Unfortunately, it was not possible to minimize the situation with the doors completely: space limitations took precedence over other priorities. During the discussions, a new priority for the team was identified, which would be to have direct access to the laboratory next door. Placing a door to this secondary laboratory would prevent researchers from going out into the hallway carrying samples - thus reducing the risk of material contamination and the need for longer journeys during the preparation of experiments that require the use of both spaces. The placement of this second door required the movement of one of the refrigerators to a position that would reproduce the current blocking situation (Figure 2). Although it was not possible to eliminate the problem of refrigerators completely, the work team was satisfied with the final result, considering that within the existing space limitations they were able to integrate a series of priorities related to improving the conditions for carrying out their production activities. work.

Figure 2 – Modification of the refrigerator position to allow access to the secondary laboratory



3.2 Expression of an experience that develops the environment for new work strategies

The second example reports the construction carried out by one of the department's technicians for the laundry space. The laundry space is a place where glass used in experiments that do not need to be sterilized is cleaned in industrial washing machines. This is the type of case for glassware and utensils used in mixtures and preparations without living organisms, such as preparing antibiotic solutions. The main process carried out within this space is the cleaning of materials used in experiments, which was done with an industrial washing machine with the support of a sink. After being cleaned, the materials were dried and stored in cabinets available to the entire department.

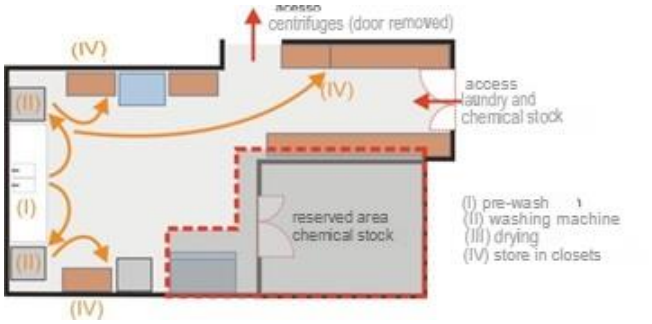
In the first meeting of the complete simulation cycle, the work team placed all the washing machines together.

They believed that this positioning would make it easier to load and unload material on the three pieces of equipment. Furthermore, it was proposed to concentrate more cabinets in the laundry room so that shared material would be concentrated in this space.

In the second simulation cycle, the technician responsible for most of the cleaning in this space was present and proposed changes to the laundry organization. This technique is the main user of this location and her priority was to have a space that would help her save time. She carried out a series of preparations for all teams and if her part was late it could delay the work of her colleagues. The most time-consuming action of the washing activity was storing the material in the cabinets. In the situation studied, all the glassware material after cleaning was moved to cabinets in the corridors and other rooms. As several of the balloons are large, the technician needed to use a cart and make several “trips” to distribute the clean material to all storage points.

When developing the laundry space in the model, the technique focused on how to organize the space in a way that helps save time in this procedure. Concentrating more cabinets in the laundry room as proposed would help the technique save time. However, the organization of the equipment was changed. His idea was to place washing machines next to cabinets to store material. This way, she could take the material out of the washing machine and, without moving, store it in the closet (Figure 3). Given the amount of material, not everything can always be stored in this way and some of it must be placed in the larger cabinets inside the room. Either way, whenever she can do this it will be a time saver that will allow her to get her work done more quickly.

Figure 3- proposal constructed by the technique to make its action more efficient



4 CONCLUSION

In both examples, what is experienced in the laboratories was decisive for the transformation of work spaces. All previous experiences, difficulties overcome and skills in carrying out daily activities are called upon for a new challenge: designing work spaces. You then reflect on previous experiences from a different perspective and what you extract from these experiences is recorded on the model.

But it's not just the project that changes, there is also a development of work activity. This transformation is revealed at different levels: from the elimination of general problems that would make

the general context in which the activity is carried out (e.g. blocking circulation) to the development of a more efficient way of working (e.g. removing clean glassware from cleaning equipment). But during the beginning of handling the model, neither of these two dimensions (activity and spaces) are clear. There is only a general idea: a space in which the activity of colleagues does not block the circulation of others or that allows for more efficient action.

In an effort to develop the space to allow for the initial formulation, we reflect on the work experiences that could be had in a new scenario. The experience carried out by workers in relation to a desirable future is then constructed. It is a development process that articulates a new way of developing the activity, but which is also

related to the development of work resources (e.g. spaces).

However, the construction of this desirable scenario will encounter limits such as limited space, resources or even the difficulty of reconciling different criteria. It will then be necessary to reformulate the objectives and priorities in order to make it possible to propose a solution that articulates the ways of working developed with the available resources. In the case of refrigerators, despite the effort to isolate this equipment from circulation near the benches, there was still one refrigerator that could reproduce the situation experienced by the researchers. In the laundry, the technician had a limited space to work without interfering with solutions created for the chemical stock, needing to respect a boundary presented to her by her colleagues. What is observed then is a non-teleological process: as limitations arise during the elaboration of solutions, the work team needs to prioritize its objectives again, creating a dialogical dynamic between the elaboration of solutions and resource limitations.

It is also necessary to highlight that the construction of experience is an essentially participatory process: those who carry out the work activities cannot be replaced in formulating new ways of developing them in a future scenario. To achieve this, it is necessary to think about supports that allow workers, who are not designers, to represent their ideas and express their points of view in relation to work spaces, but also in relation to work activities (Turchiarelli et al., 2012) .

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6. BIBLIOGRAPHIC REFERENCES

BÉGUIN, P. Argumentos para uma abordagem dialógica da inovação. **Laboreal**, v.4, n.2, pp. 76-86. 2008.

BEGUIN, P. **Conduite de projet et fabrication collective du travail : une approche développementale.** Tese (habilitação para dirigir pesquisas) – Escola Doutoral: Ciências Sociais. Universiade Victor Segalen Bordeaux 2. Bordeaux: França. 2010

BÉGUIN, P. Design as a mutual learning process between users and designers. **Interacting with Computers**. v.15, n.5, p. 709-730. 2003.

BÉGUIN, P. Taking activity into account during the design process. **@ctivités**,v.4, n.2, p. 115-121. 2007.

BÉGUIN, P. ; WEILL-FASSINA, A. **La simulation en Ergonomie. Connaître, agir,**

BITTENCOURT, J.M. **A expressão da experiência de trabalho em projeto: argumentos para uma engenharia de objetos intermediários**. Tese (doutorado em Engenharia de Produção)- Universidade federal do Rio de Janeiro, Rio de Janeiro. 2014.

DANIELLOU F. The French-speaking ergonomists' approach to work activity: cross-influences of field intervention and conceptual models. **Theoretical Issues in Ergonomics Science**, v.6, n.5, p. 409–427. 2005.

DANIELLOU, F. A ergonomia na condução de projetos de concepção de sistemas de trabalho. In: Falzon, P. (Org.), **Ergonomia**. 1ª ed, capítulo 21, São Paulo, Editora Blucher. 2007.

DANIELLOU, F. **Le statut de la pratique et des connaissances dans l'intervention ergonomique de conception.** Tese (Habilitação para dirigir pesquisas) - Université de Toulouse-Lemirail, Toulouse, France. 1992.

DEWEY, J. **A arte como experiência**, 1ªed., São Paulo: Editora Martins Fontes. 2010.

JOAS, H. **The criativity of action**, 2ª ed. Cambridge: Editora Polity Press. 2005

MALINE, J. **Simuler le travail. Une aide à la conduite de projet**. 1ªed. Montrouge : ANACT. 1994.

RABARDEL, P.; BÉGUIN, P. Instrument Mediated Activity: from Subject Development to Anthropocentric Design. **Theoricals Issues In Ergonomics Science**, v.6, n.5, p. 429-461. 2005.

RABARDEL, P.; BEGUIN, P. L'utilisation des fichiers CAO par les concepteurs comme outil de gestion du projet et d'organisation de leur activité. In: K. Zreik, B.Trousse (eds). **Organisation de la conception**, 1ªed. p. 141-151, Editora Edition Europe. 1995.

SCHÖN, D. **The reflective practitioner. How professionals think in action**. 1ªed., New York: Basic Books. 1983.

TURCHIARELLI, A.; BITTENCOURT, J. M. ; BEGUIN, P. ; DUARTE, F . ; Le Lego de la Plate-forme Photonique : proposition d'un objet intermédiaire pour la conception. In: **Actes du XXXXVII Congrès de la Société d'Ergonomie de Langue Française**, p. 94-100, Lyon, França. 2012.

WISNER, A. Understanding problem building: Ergonomic Work Analysis. **Ergonomics**, v.38, n.8, p.1542-1583. 1995