

Designing and teaching closer to reality: an approach from ergonomics viewpoint

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Abstract

This article discusses the benefits of applying the Ergonomic science to the practice of architecture and to the teaching of project process in the Brazilian Architecture Schools. The Ergonomic science will be presented as a complementary tool to the conception process of architectural designs. The distance between a designer (architect or architecture student) and the reality can lead to inadequate conception projects. Designing far away from the reality has contributed for the absence of the social role of the Architecture and its school. This article suggests the incorporation of two tools of the Ergonomic science methodology: (I) the ergonomic analysis of the work and (II) planning of future activities. By incorporating these tools to the design process in education, professors will be helping students to avoid the quest for "one fits all" formula, since the Ergonomic science considers the specificities of each situation and their solutions proper for studying situations. Also, during the conception process of architectural designs, the suggested Ergonomic science approach helps to narrow the relationship among the actors and the architect involved in that conception, since it minimizes the difficulty of information gathering. Hence, this facilitates the reflection and the visualization of the reality the architect will be transforming.

Key Words: Teaching, Design, Ergonomics, Architecture, Space

1. Introduction

Ergonomics tries to visualize the work and to evaluate its consequences on comfort, health and safety for whoever does that work. There are several conceptual definitions on what ergonomics is and each one is related to a single approach. However, it is possible to state that all definitions agree about its objective: the human work.

A definition considered as appropriate for this article was proposed by Daniellou [1]: Ergonomics studies the work activities in order to contribute for the conception of work adapted to the physiological and psychological characteristics of the human beings. So, a device, a tool, a workspace and the space itself- where activities happen – are all considered workspaces.

Human work should not be understood in a limited way as productive work or paid work, but in

a wider way as “activity” (2). Understanding work as activity and considering the space as an environment for carrying out those activities, it is possible to say that Ergonomics also aims to contribute for the conception of appropriated spaces for users to execute their activities.

Space adaptation to its users is the concern of Ergonomics and, also, of Architecture. The only difference is that while Ergonomics focuses the activities already carried out, Architecture has the priority on the use of space, and on the emotional and historical references of its users.

Both study areas address important points. They must be taken into account during the conception process. In this article, a discussion on the possible contributions of Ergonomics for the conception process of architectural design is presented, which emphasizes the importance of studying the activities carried out by the users in the workspace.

Firstly, a transmutation of the architect’s role and of the design process along the time until the emersion of an Ergonomics approach: to make design closer to reality.

Then, the difficulties that Brazilian architects and architecture students face to get closer to reality, they are going to design for, are presented. Finally, the benefits that Ergonomics may bring to the architecture practice and to the design teaching process in the Brazilian Architecture Schools – which have not yet incorporated Ergonomics as a subject in their Undergraduate Architecture Programs - are going to be discussed.

So, Ergonomics will be here presented as a complementary tool for the architectural design conception process.

2. The evolution of architectural practice

Along the time, the architect’s role has simultaneously transformed with the design process:

In the Middle Ages, the architect was one of the several actors that created a conception. He had a certain authority and coordinated other actors, but he was not the only one responsible for the design conception.

The architectural work was known as self-creation developed in the work site [3].

In the Italian 400’s, a revolution of the architectural practice happened.

In the beginning of the 15th Century, Brunelleschi broke off with the middle-age tradition transforming the architect’s role. He then became the only

responsible for the design and its execution techniques. Separating design and execution, Brunelleschi intended to separate the architectural conception from its execution. The architect is identified as the unique generator. This new rationality has established a tradition that lasts until nowadays [4, 5].

The end of the Second World War marked the beginning of numerous researches on the process of design conception:

In the early 40s, William Pena defined the architectural conception as the process of solving a problem. From a given necessity, the conception process was organized in two stages: programming and elaboration. Programming consists in correctly formulating the problem and elaboration in solving that problem [4].

From the 60’s on, Alexander [6] proposed a rational method without modifying the two installed work divisions – programming and elaboration. He analyzed the architect’s activities as a solving-a - problem activity and tried to help the conception process. His main idea is that the conception problem is a mixture of numerous problems

He proposes to separate the initial problem in a sequence of sub-problems easier to be solved until becoming just one element.

During the decomposition of the problem he emphasizes the need of including and making the future users participate in this process. The architect’s role is not simply to solve a problem but to allow adapting a space to personal aspirations.

For Friedman [7], an architect defines the average user and from that imaginary character performs his/her work generating power abuse and double-meanings. That brings a desire of eliminating all intermediates between the user and his house. The client defines his own house and the architect forecast an infrastructure where it is possible to integrate the house chosen by the user. The architect’s role is cartooned as a translator of the users’ needs in an understandable language.

For Conan [8], the architect helps a group from a specific cultural group to prefigure a place. He/she organizes the interactions among different actors and users that develop and implement a design. This process consists in explaining the problem, exploring the architectural implications and allowing progressive adjustment of relative intentions to the use and the technical / architectural possibilities. A collective work of choices and decisions is necessary.

Prost [9] proposes reflecting about conception. Its approach encompasses the problem formulation and adjustment and transformation as part of the conception matter. He infers that no matter how complex a problem is, its statement does not have the operating elements capable of bringing a solution. Solution goes through constant agreements among actors involved in it and so the design process is dynamic and not linear and the emerging solution is the result of an interactive journey.

This interactive journey allows to identify and to present a problem creating a reality. This is the epistemological and philosophical base of the constructive conception. For constructivists, reality is not a ready data but a still-in-construction one (cognitive, social....) of an observer. The environment depends on the way it is seen and it is an invention of the observer. Then a problem depends strongly on the characteristics of the actors in charge of solving it [10].

Granath [11] introduces the notion of collective conception to distinguish a new dimension of participative conception:

All actors are considered as specialists and participate with their own knowledge, developing a creative act.

The participative conception is also discussed by Sanoff [12]. He shows that the users' involvement in the design decision-making process is the only way of guarantying considering their needs and values.

So, conception is the result of collective work of several actors (architect, users, contracting, design executors and keepers). The conceptor is not a creation genius who follows the nuances of his imagination nor a isolated individual. The conception process is a complex social activity that involves numerous ways of interaction among actors thinking differently.[13].

Under this view, Ergonomics helps the architect to conduct the architectural design and to articulate interactions among several actors who together construct the problem.

This way, the conception process can be understood as an exploration activity that prioresses defining the problem and not solving it, in dialectical relationship among people involved, the context where they are in, and their activities.

3. The architect's difficulty of being close to reality.

Conducting an architectural design is still a hard task for the architect. He deals with the difficulty of getting closer to reality he designs for [14]. Normally the client (business or contracting people) transmits the necessary information for developing the design. The interaction between the architect and the situation he is designing for is mediated by the client, maybe never having a direct interaction with the design's future users or having a very superficial interaction. This way, the architect and the client believe they are able to completely control a building and to design what it will be in details on a piece of paper. This is the train of thought which Alexander [15] contests, because designs are conceived founded on the representation that the client has of the situation. The representation of the client is then interpreted by the architect generating a new representation of the same situation. Each of these representations do not correspond to the representation of each user involved in the same situation.[16].

The differing representations of the situation, the differences between affective values and the attitude of architects, contracting people and users and even other actors (tenants, owners, contractors, employees, etc.) can lead to perception and expectation conflicts [17]. These conflicts can lead to design rejection.

So the architectural design may fail due to the kind of interaction or to the lack of it, or to the lack of negotiation opportunity among several actors, in the conception and development process of design that may lead to better made decisions. The lack of interaction and negotiation hinders the social construction of the problem and the proper transformation of the reality men is inserted in. [18]

To approximate the architect and the user, as well as other actors, to the reality he designs for, methodological tools can be assimilated from Ergonomics in the conception and development design process. These tools are later presented in this article.

4. The difficulty of the architecture student to get closer to reality

The difficulties faced by the architect to see the "human being" for whom he is designing a space and to get him involved in the process of conception and development of the project may have their origin in the Brazilian Architecture School. The relationship

between the architect and his/her client is somehow similar to a student/professor relationship.

Normally the professor creates a fictitious situation for the student to exercise designing. The professor establishes the guidelines, conditioners, client's profile, program, piece of land and other information so that the students establish a solution for a given situation. In the same way, the student is not stimulated to get involved with other people in order to design [19].

That makes us think about the practice of teaching design. In a general way, the expositive methodologies are still very used in the general teaching practices of the design classes. Their applications bring some concerns regarding the low level of interaction and learning. A student receives everything ready, without knowing how to problematize the presented content, without being able to relate it to any previous knowledge and to contextualize the received information. The student learns by memorization and the professor is not capable of transmitting the meaning of that transmitted knowledge or, sometimes, he does not know the meaning of what he is transmitting [20].

Even though these problems are already known, the expositive methodologies last up to the present due to their social legitimization, legitimization by the evaluation and by the tasks to be accomplished, for their low costs, convenience for the professor and for social reproduction [20]. The pure application of those methodologies would not be adequate to the Teaching of Architectural Design.

We believe that the teaching of architecture design may seek fundamentals in the dialectical theory, because the student must learn how to design for his/her society, inserting himself/herself in that reality in order to transform it [18].

The same way that Ergonomics provides methodological tools that may be incorporated in the conception and development process of an architect's design, they may also be incorporated to the teaching-learning process of architectural design, making the student and professor closer to reality, as it will be later discussed in this article.

5. The benefits that Ergonomics may bring

When the distance between the designer (an architect or an architecture student) and the reality, where they are inserted in and for which they are going to design for, is big it becomes possible to create inappropriate designs. The architect can

characterize himself/herself as alienated and then contribute for the loss of the social role of architecture.

It is fundamental to recover that social role, to show it to society and to organize this profession in a certain way that it may effectively work as an instrument of social inclusion and development. [21]. Therefore it is necessary to identify the social demands in order to act on them and to transform the reality trying to adjust it to its society.

This way, we understand that ergonomics provides tools to make the designer closer to reality. The first of these tools is called Work Ergonomics Analysis – AET 2,22 –whose idea is the analysis of human activities. This methodology highlights the peculiarities of the studied situation and reveals the experience and the difficulties of whoever executes those activities.

The other tool provided by ergonomics is the prediction of future activities, that is, those that will still be created. In these cases, ergonomics suggests that we make a study on reference situations, which are similar to the situations we are designing.

The so called reference situations are a set of the activities' determiners: their possible problems, people involved and their objectives, the information sources, the environments and the tools necessary to accomplish those objectives, the disturbances that happen during the execution of those objectives, the factors that condition the individuals' internal state and that may influence their health.

The importance of these reference situations is that they lean on reflections, simulations and negotiations among the different actors involved in a conception. The confrontation of different logics for the design elaboration is a confrontation of facts on which it is possible to negotiate compromises about an acceptable future [13].

Even though each situation has its own specifications and the information brought up by that reference situation may not be entirely appropriate for the situation to be designed, experience has proved that the design mistakes are less when the design is elaborated in accordance to the architect's exclusive representation.

So, we observe that both tools emphasize the knowledge on that activity. Every human being executes activities that happen in a specific space. Activities are not easily visible for people not involved in their execution, and whoever executes them can hardly express or explain how he/she acts in or order to carry out those activities. The space users can define, at the most, which are their tasks,

that is, the objectives they must accomplish to reach those results [1].

This definition of tasks is superficial for the architect, once it does not show which are the activities determiners, and neither the difficulties faced by whoever carries out those activities in the space. This is essential, because, as part of those difficulties may be related to spatial inadequacy, the knowledge of these activities is essential for problem solving.

Understanding these activities may insert the architect in the universe of the user for whom he is designing. This insertion will cause direct interactions between him and the users leading to a process of building a problem. It will be up to the architect to involve the client as well as other actors (contractors, tenants, maintenance keepers, etc.) in that construction and to negotiate the interests of all parts [5].

However, communication among actors is not easy. The architect faces difficulties to obtain necessary information to conceptualize and define the design. On one hand, he/she has technical knowledge and the design knowledge. On the other hand, the users have knowledge of their activities and their needs, which may be unconscious, making it difficult for them to verbalize what they know [16].

The difficulty of dialogue among all parts and of negotiating the interests of each part is smaller when everybody discusses about a shared knowledge and not about something unknown. It is up to the architect and to the ergonomist to intermediate interactions using mediating objects (texts, drawings, calculus, maquette...) called intermediate objects [23]. These are ways of transmitting and of translating ideas that can be carried out or transformed, with which the architect dominates their techniques.

However, it is important that these resources be used without the anxiety to conclude the interactions, because the intention of using the intermediate objects is to stimulate discussions, confront information and try to clarify the facts still obscure in the verbalizations [13].

At each step of the design, the possible decisions have to be validated with all the agents. This validation allows once again people to retort, approve or improve the given ideas, amplifying and consolidating the construction of knowledge that will give guidelines for the conception of a new space appropriate to their users' needs.

The architect is in charge to materialize the indicated guidelines into a design, and certainly, to consider theoretical knowledge to carry it out. The design process must not be completed with the conclusion of the executive design, as we know that during execution, the design may suffer alterations. This way, the presence of the architect as an articulator of interactions becomes fundamental for the design's success.

The articulating role of the architect can be stimulated at school, under the professor's orientation. The design classes can contemplate the works at real situations, wherever there is a real demand for work. The student would have the opportunity of getting involved with real users, counting on the professor's orientation. The professor will perform an essential role instigating the student to build the social problem he will be designing for, together with real actors.

At the same time that students would be able to practice their future profession in a real way, professors would be helping the Brazilian School of Architecture to recover its social role, once they could involve students in social demands and would try to provide more quality of life to the population through their designs.

6. Conclusion

Ergonomics provides methodological tools such as the activity analysis and the prediction of future activities that make possible its practice and that can be used by architects and students to build the problem, determine the program and plan the guidelines for solving the design.

By incorporating these tools to the design teaching process, professors are making students farther from what is called "cake recipes" in order to apply the tools in all the works to be done. Ergonomics considers the specificity of each situation and it also considers that the found solutions apply to the studied situation.

The focus of Ergonomics in the conception of architectural designs narrows the relationship among actors and the architect or students/professor, through the analysis of activities. Then, all can reflect and visualize the reality they are going to transform.

Making professors, students and architects closer to reality will help to recover the social role of the school and of the architecture practice. The design classes should consider acquisitions for

students, for society through design proposals in which the student can learn in a real situation. When the student does not have the opportunity to visualize or to get closer to reality during the time at the architecture school he/she will possibly tend to forget his/her role in that society much easier when he/she becomes a professional.

Communication among the architects and the other actors participating in the design process is hard and asymmetric. It must go beyond the linguistic barriers to allow that they confront their knowledge and explore their competence reciprocally in order to build the problem, which refers to common interpretations that arise from a collective experience.

7. References

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