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Ergonomics and Sustainable Design: A Case Study on Practicing and Teaching

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Abstract

This paper, which stems from a larger research project, focus on the important role played by ergonomics within the conceptual design process, through the case study Daciano da Costa. We intend to disseminate among the international scientific community Daciano's developed work underlining the importance he conferred to ergonomics in design process, throughout his teaching career and his professional practice. Daciano conceived numerous interior and product design projects of outstanding quality from the early 60's onwards until 2003. His work made him one of the most relevant figures of the twentieth century Portuguese Design. We'll focus not only on his studio work, but also on his work as a teacher at Lisbon Technical University where Daciano created, in 1991, the first undergraduate Design degree in Portugal. As a professor, one of his main concerns was the student's recognition of the importance of ergonomic factors when designing, developing and supervising the exercises he set. In those days, Daciano brought innovation to the practice and teaching: a modernization of processes, a new perspective on the emerging themes of design such as ergonomics and sustainability. He believed that designing was providing a service. This task was understood as the building of a relationship between the object and the users. Throughout his career, both as a designer and as a teacher, he contributed for a holistic approach to ergonomics implementing a broad understanding of its full scope in order to design safe, effective and productive work systems. He implemented a design process which deals with sustainability and social commitment, searching for simple long-term solutions that could last and fulfil human needs, causing minimum material waste.

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1. Introduction

We can't speak about Portuguese Design without referring Daciano da Costa. He was one of the pioneers of industrial design in Portugal. Daciano's interior design and equipment projects followed the ergonomic and sustainability values. He has played a pioneer role on design's theory fundamentals in Portugal and an important pedagogic role as teacher.

In 1991, Daciano created and implemented the Design Course Plan at the Faculty of Architecture, Lisbon Technical University, being its coordinator since then until 2003.

Daciano's teaching method was remarkably operational, within a wider understanding of ergonomics and how to apply within a wide range of design solutions. As a professor when conceiving, developing and supervising the exercises he set, the student's recognition of the importance of ergonomics and sustainability were one of his main goals. For him good design should last, solving relevant problems, giving form to common useful objects, following a user centered design approach and with ergonomic perspective.

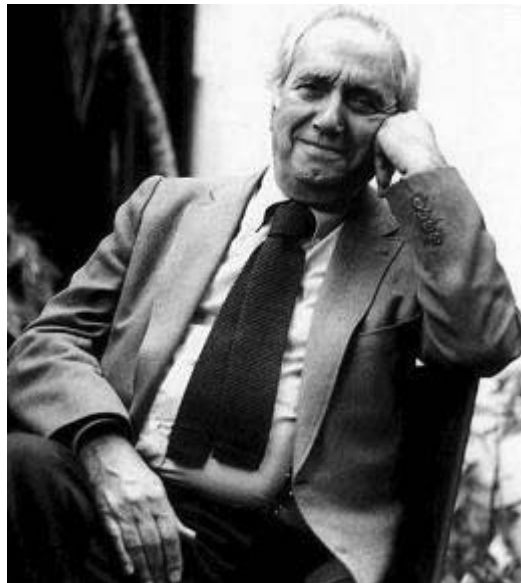


Fig. 1. Daciano da Costa (1930-2005).

2. Daciano's Practicing and Teaching

Daciano da Costa stated that "man is the real protagonist of space" [1]. He was concerned with the design of systems in which people carry out work.

According to Cushman & Rosenberg [2], product design is the process of creating newest and better products for people to use. Ergonomics is responsible for the product usability focusing in the comfort, efficiency and safety.

As Osborne [3] outlines, a major role of ergonomics is to identify design issues which involve the human component of the work system.

For Daciano [1], ergonomics contributes for the design and evaluation of work systems and products, in a way to ensure that the working environment must be designed to fit people's thoughts, wishes and abilities. In the design for everyday life situations the focus of ergonomics is man.

To exemplify those issues in Daciano da Costa's work we present some of his sketches that represent a clear and direct demonstration of the importance he conferred to ergonomics in the design conceptual process, since the first

One of his distinguished features was the particular attention he paid to the unique aspects of the scale of proximity: the scale of the hand, of the immediate gesture, of the body. Both as a whole and in detail he was sensitive to relations of scale and proportion of the users.

Ergonomics were always present along the several stages of his design conceptual process.

Daciano's projects never result in a superposition of isolated or separately thought elements, but in a whole relating architecture and design. In this search for unity, design becomes an autonomous discipline, by the symbiosis with architecture, being an important part of the overall work.

The following figures, representing some of Daciano's design solutions for public spaces in the sixties, show how he established the balance between aesthetics and efficiency, creating workspaces cohesive and harmonious [4]. Most of this spaces are still used satisfactory nowadays, as, for example, the National Library and the Calouste Gulbenkian Foundation Library, both in Lisbon.



Fig. 4. National Library (1965-1968).



Fig.5. Calouste Gulbenkian Foundation Library (1966-1969).

In the interiors he designed, such as the reading rooms of these two libraries, the comfortable armchairs and their surroundings create an atmosphere, in the relation between the architecture and its furnishings, where users set and remain in such spaces specially created for the purposes of pushing their capacity for study and concentration. Inside, we are able to feel calm and harmony in an ambiance that escape from the bustle of the city. For Daciano it would not simply be a case of distributing areas and uses; in the design of the interior spaces, their physical dimensions and their metric relations would have to be closely aligned with the sensory dimensions, which are measured by the quality of the environments, humanizing this spaces.

Daciano revealed an early interest in the values of rationality and functionality, which he aimed to incorporate into his work, in common with what he saw happening with other pioneers of modern design abroad[5]. Daciano maintained a notorious ethical position committed to restoring the human dimensions of architecture and objects, humanizing the collective space, establishing a more friendly and suitable working environment. [6]

His interior design and equipment projects followed the needs in terms of functionality and coherence, always under the ergonomic and sustainability values.

Design for sustainability requires generating solutions that are equally beneficial to the society in general [7] and to the communities around us, to the natural environment, and to the global, but especially to the local, economic systems [8].

Daciano believed that designing was the contribution to a shared responsibility in achieving sustainable products. This commitment meant to him designing solutions while seeking for a balance between social, environmental and economic aspects. In spite of Sustainable Design being a recent discipline, Daciano in the early sixties tried and achieved new experiences in this context proposing solutions to help then finding ways socially, economically and environmentally sustainable. This was the case of Longra, a furniture factory dealing with huge problems that would lead to unemployment of numerous workers. For Longra, Daciano managed to achieve a furniture production for internal consumption instead of importing from abroad, using local resources combining lasting natural materials with Portuguese technology and handmade tradition. Although being industrial serial production, he introduced human control and human resources incorporating a Portuguese identity through the use of local long lasting materials, local workers and local technology in search of what he intended to be the real concept of sustainability.



Fig.6. Cortez Line desk produced by Longra Steelworks, Daciano da Costa (1963).

Daciano was involved in the process of understanding the need for comprehensive integration of human capabilities, social needs and local resources into the design system. His creative process improved to conciliate the ability of the designer with the needs of the producer and his workers skills, but also with the local resources and long lasting forms and materials.

The commitment with the industry was indeed evinced in the exploration of the office furniture systems, with the choice of long lasting materials and with the rationalization of the industrial production reusing old methods and machinery. This Daciano's options permitted to obtain pieces of furniture that are still in use nowadays, because of their timeless linear shapes and the quality of the materials in which they were made.

At a time when the fledgling industry offered was limited and undefined, there was so much to be done. These particular circumstances produced a need for opportunity to design a global project with a sense of coordination and coherence. An integral relationship between the nature of project production and the cultural, economic and social context.



Fig. 7. Desk chairs produced by Longra,Daciano da Costa (1962).

Daciano da Costa believed that designing was providing a service to the community and so designers should assume new social roles towards a sustainable development. On his own practice and teaching he implemented a design process which deals with sustainability and social commitment, searching for simple long-term solutions that could last and fulfil human needs, causing minimum material waste.

Daciano da Costa considered essential to provide to the students the understanding of the importance of ergonomics in the conceptual design process. Professor at the Architecture Faculty in Lisbon from 1977 to 2003, he contributed decisively for the formation of many architects and designers.

Design production applied to daily life constituting a new territory of social, cultural and environmental interest, representing the several thematic and conceptual approaches carried out by Daciano's teaching principles, providing for the future designers the enrichment of their training and knowledge.

Defending a constant learning and a permanent adaptation to new paradigms Daciano stated: "From an educational formation we can only expect that it teaches us to learn and we all will have to go back to acquire new skills, as a preparation for the new tasks that the developments in technology and social evolution will make to emerge." [1]

Daciano's teaching method was remarkably operational, within a wider understanding of ergonomics and how to apply it and the recognition of what the subject can do.

As a professor he insisted not so much on the end product, but rather on the recognition of the research process and how it was conducted. [9] When designing, developing and supervising the exercises he set, ergonomic factors were one of his main concerns.

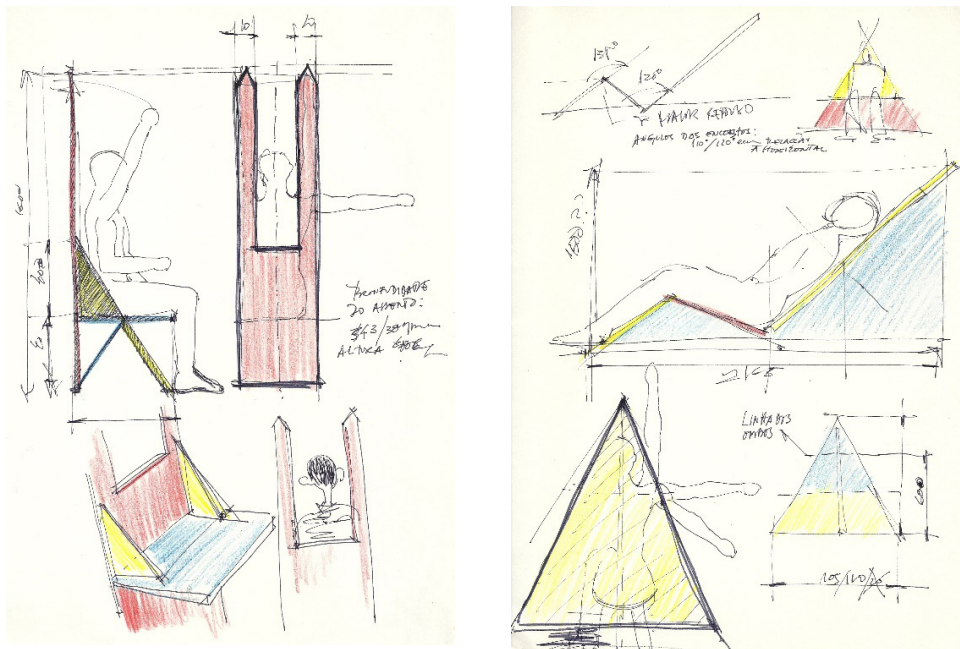


Fig.8. Student's sketches showing ergonomic concerns, corresponding to Daciano's exercises.

3. Conclusions

Throughout several decades, Daciano was a striking figure in the development of a culture for design, not only because of the relevance of his project work, but also because of his influence as a teacher and a spreader of the new project thinking ruled by ergonomic principles.

The products he created maintain the same synthetic sense where complexity becomes simplified, where tradition is integrated into contemporaneity in the process of industrial design. Sensitive to relations of scale and proportion, as a whole and in details, his works achieved a balanced humanism.

As a designer and as a teacher, Daciano contributed for a holistic approach to ergonomics implementing a broad understanding of its full scope in order to design safe, effective and productive work systems.

The person-centered view of ergonomics is so important today as it was years ago to Daciano da Costa, although, with the passage of time, more material is now available to support the argument that whatever happens within the system it is the individual human being who is the "prime actor".

Design projects developed by Daciano da Costa can prove that the real dimension of his work greatly exceeds its strict physical function as objects and they take on an eminently social dimension implementing interaction between the interests of the industry and his workers needs and skills, but also with the local resources in a sustainable way. His design thinking successfully operates the mediation between the designer, the industry and the society. Since the early sixties he always tried to develop a close relationship between human systems integration and production systems engineering when dealing with the Portuguese industry.

We can consider Daciano's working solutions for Longra Industry as 'sustainable' achievement (we must point out that in the sixties this concept was not yet established and meaningful), an innovation anticipating one of the main transversal aspect of nowadays design: sustainability.

Daciano's work, both in his teaching career and in his professional practice, can be considered as an innovative one, bringing a new perspective in those times, given the importance he conferred to ergonomics and sustainability in the design process.

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