FUNCTIONALITY AND INCLUSIVITY IN WHEELCHAIRS: 
Between the Security of the Known and the Challenge of Innovation

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SUMMARY
The analysis of a methodology for the construction of a wheelchair involves a number of factors that may prove decisive, because one is working with people who require adaptations of physical social structures. This integration between the two parts generates the non-inclusion of an individual in society, with direct consequences on his daily mobility. The selection of a wheelchair, anthropocentrically adapted to your body and emotionally well accepted, is an essential requisite to a better integration of people in society, not disregarding what society can and shall do for them. This text broaches some challenges that this type of analysis raises, with particular emphasis on the individual and cultural significance of the relationship of form - content in a wheelchair. It raises some issues that may become relevant, especially when complemented by a quantitative analysis of data.

KEYWORDS
Inclusiveness; Aesthetics; Usability; Customization

1. INTRODUCTION

The deficiency has been seen over the last centuries according to the moral or religious model in which disability was something to hide. The disabled person was removed from society, leading to his complete exclusion and often to the bad name of his family. In the nineteenth century and with the medicine advances, it has developed another way to confront people with disabilities, where rehabilitation, when possible, was focused only on the individual. With the emergence of the social model, the integration of disabled people should lead to greater participation of adaptation by society. At this time, the "International Classification of Functioning, Disability and Health", approved by WHO is the most recent disability rating.

The development of this classification has introduced an extremely important concept for the improvement of the inclusion of the disabled person, considering that part of the problem is due to the environment and its lack of suitability to the capabilities of people. According to the Census 2001 in Portugal there were, on that time, approximately 150,000 people with motor disabilities of various degrees. This number represents a large group of people with special needs and that require an adaptation of society to their condition. Many of these people rely on a wheelchair for daily mobility. In addition to this, and because of the enormous diversity of associated diseases, the need to provide solutions that are difficult to achieve, in the case of the non-involvement of society to solve the problem.
2. IMAGE VERSUS FUNCTION

Since the manufacture of the first wheelchair with tubular structure, in the middle of last century, that new materials and structures for their design have arisen, nowadays easily reaching the value of several thousand euros. In retrospect, with the industrial revolution of 1850 and subsequent investment in mass production, it was given particular importance to the functionality of a product, its aesthetics and marketing considerations. These values have been gradually replaced by political concepts, social or cultural. Thus, we can say that objects have to make sense to those who use them, have to be "perceived" by everyone.

This way, objects begin to be understood as having a cultural significance beyond its form or physical properties. Perniola [Mario 2011] identifies the choice of the consumer product as the deprivation of its functionality by transferring the image of who uses it or consumes it for himself. According to J. Baudrillard [Baudrillard 2005] [Baudrillard 98], there is a process of social classification and differentiation by the object of use. If we report these concepts to the use of a wheelchair, easily identifiable as the subject of social exclusion for many people, we understand the need of integration by the image of the set.

In a qualitative study, made with interviews, these questions immediately emerged from the users of wheelchairs. The concept of "grey" usually connoted by the image of the chair and the feeling of exclusion that they still feel from the society is a very present feeling in those who need to move in wheelchairs. There is a real need to use the chair as an extension of the body, but not "grey", meaning that people shall not look first to the chair and then to the person that is sitting on it.

By contrast with this result, in a quantitative analysis to a set of 114 people questioned about the order of importance of various factors such as stability, stiffness, weight and color, among other things, it has been verified that the color factor is the least important characteristic of all nine selected [Costa 2011]. In this quantitative study, users value most the technical/functional characteristics and finally the shape / model and color. If we look at the pyramid of Bonapace [Bonapace 2002] or even the hierarchy of needs of a consumer of Patrick Jordan [Jordan 2000], we see that the results observed in the study are consensual. This analysis raises a problem to be considered in a future study because it really matters ask ourselves about the meaning that has the image of a person in a wheelchair for society in general and how the user feels the chair as almost part of his body, as an extension of it. Not only the analysis of functional factors, but also emotional, is increasingly important to be considered in the development of a product. In a study by Pieter Desmet [Desmet 2000], the aesthetic changes of a wheelchair analyzed by the Premo method to a focus group Children (users)/Parents revealed that the development of the aesthetic component reveals positive emotions, making the chair an element less stigmatizing. However, this concept should not make the chair too conspicuous. The aesthetic evolution is to be achieved so that the whole chair / user achieves an unobtrusive integration, not "calling attention" either by negative or positive emotions, considering the positive ones based on a big aesthetic change, from the common concept of a wheelchair.

One of the key factors to consider when designing a wheelchair is no doubt the group to which it is thought, where economic, social and cultural factors have to be considered. Culture, according to Baudrillard [Baudrillard 2005] always had a pacifying ideological role, reducing stresses associated to functional factors. It is this capacity for detachment from the material world and from its conflicts that will largely regulate the relationship between the user / chair / society, better or worse integrating an object, depending on its shape, which translates into the emotional interpretation of the subject, first by the individual and then by the society that surrounds him. We can also observe the relationship user / chair through a psychoanalytic perspective where the user will have to establish a functional or possession relationship with the chair, the transitive object. This stronger link to the object puts completely aside the functionality of the object itself as a finality, creating instead a symbolic representation of the object. It is still a valid interpretation if we consider that the wheelchair must always match the user, creating symbolic links throughout his life. Once again the cultural and social factors are crucial in creating the quality of these links.
By an analytical approach to the wheelchair we can summarize the whole to just a main function, but by leaving that function in the dominion of individuality, we are increasing the number of possible features mentally endless where any fantasy can take place. "Modes of imaginary follow modes of technological evolution" [Baudrillard 2005]. This statement takes the concept "form follows function" to another level increasingly important, not only in the design area but in all areas, because it is a transversal human concept. In the dominion of design Krippendorff also says "Design is making sense of things", giving a more important meaning to being, to feeling, to meaning, to which Baudrillard refers to as signals. The integration of an object is closely linked to its customization, which allows a constant revival of the base concept by the individualization of a series of distinctions that belong to the individual imagination. The object must be regarded as an idea rather than any process of consciousness, where the wheelchair can be rebuilt or customized, if the basic idea makes the difference, compared to other models. Following the concept that a wheelchair aesthetically renewed should change the integration image of the user (not to be confused with meaning), it has been shown a picture of a wheelchair to a group of 150 people without physical disabilities and other 114 users through a questionnaire. The chair had the particularity of having only three wheels and no tubular structure of carbon fiber. They have been asked to comment the image as they wanted, foreseeing the eventual use of the chair. The object under study is not literally translated into the solution of three wheels, but into the image of a chair really different from the conventional ones in structure. It was not intended to analyze any emotional or functional aspect in particular, as the issue has been put openly. Thus, the interpretation of the object or its basic idea was left to the individual imagination, powered by the difference to the common ones.

Without having mentioned the term security, most people of either group first expressed concern about security, saying they would prefer the conventional 4-wheelchairs, without further explanation. The group of users, despite having made the same observation, was able to give examples of situations where the chair could become unbalanced, particularly when entering the car or picking up something off the ground. Beyond these comments, the vast majority of users expressed concern because of the fact they could fall if the single wheel was stuck. Gibson [Gibson 86] states that people do not understand the objects but their usability and that this perception is closely tied to what each one can do with his body. Thus, it is natural that users of wheelchairs have given concrete examples of the use of three wheels and that people who have full use of their legs have not done so.

Despite the reluctance to use chairs with three wheels, it is curious that the vast majority of users has offered themselves to test the chair, taking a cautious but very curious attitude, opening the door to experimentation. It is still however a doubt if this model would have an acceptance by the majority of users when confronted with their purchase [Zaltman 2003], as it happened to Ford Edsel in 1957, after the largest market study that was known at the time. It remains so to see how much each aesthetic solution adopted is accepted by people, mainly by how they understand that the difference in the image could be a factor of more exclusion. This feeling is determined by cultural and social factors and would have to be studied based on the group or on the area in which it is intended to commercialize this kind of concept. The differentiation between the functional concepts in the construction of a wheelchair and cultural and individual interpretation that each user makes of it must be understood by the builders of chairs. Unlike some market researches that conditioned and disappointed the designers because they have focused their attention only on the sales of the product [Krippendorff 2007], the cultural study of the object has become increasingly important and necessary to the success of the product and to the satisfaction of the designer. According to Karmasin [Karmasin 2007], this interpretation or meaning will add commercial value to the product. If we could consider the "relationship" between the user and the wheelchair using a false identification of "I" in the object by an emotional, functional and aesthetic approach, this would have to be created at the stage of commercialization of the product and would give the subject a false perception that the object was offering some human warmth. This commercial approach can be useful because it will create links between subject and object, causing the subject to feel closer to or identified by the object. This feeling allows the majority of subjects to feel part of something, to feel alive, loved. When it comes to wheelchairs, that feeling becomes more important and easily attainable for marketing operations. The exploitation of the object semantics, since Donald Norman [Norman 2004] raised the issue on psychological
aspects, to an economic perspective of Design, passing through such diverse areas as anthropology and architecture, has claimed the attention of a vast number of researchers and is becoming a most important dominion for better understanding and integration of the object wheelchair by the society and user.

3. SYNTHESIS

The dichotomy we face in the methodological analysis of the selection of a wheelchair model by a set of users leads us to a point where the importance that we want to give to demonstrations of affection, aesthetic, emotional or other related has its correspondence to other factors resulting from external factors and measurable. Mitsuo Nagamachi, with the method "Kensei Engineering" deals with this dichotomy, many other researchers also give their contribution with methodologies and thoughts in such diverse areas as engineering, medicine or psychology. What is truly at stake here is the study of Man, his fears, his needs, his relationships. For this task, all the sciences are important, all begin and end with Man.

4. REFERENCES

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