AN ERGONOMIC APPROACH TO REDESIGN A TIN AND BOTTLE OPENER

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1 Context

Can openers have little variation among commercialized models, and are usually small, thin, uncomfortable objects, only for right-handed, and require a very large effort to use. Its blade, which is its main component, is exposed, and puts the user at risk. It is a widely used object, which makes even more evident the need for adjustments of its shape, in order to ensure the comfort and safety of consumers. Thinking about it, the project began to rework the traditional opener model, which is made with a thin metal plate and usually has a built-in bottle opener, and make it more ergonomic, more comfortable and safer. In order to ensure that the final prototype reached the goal, two usability tests, the System Usability Scale and the Semantic Differential, were applied both to the common opener and to the prototype. In this way, it would be possible to compare the two products and judge whether the redesign was advantageous or not.

2 Method

The project provided for the application of usability tests to common openers, already being sold in the market; the analysis of the results obtained and the evaluation of the points to be improved in the product, with the later establishments of the project guidelines; the construction of the physical prototype; the application of the same usability tests to the prototype and; finally, the analysis of the performance of the prototype in the tests and the comparison with the results of the first test.
Studies began with tests done on a common can opener. Two different methodologies, the System Usability Scale (SUS) and the Semantic Differential (SD), were used. The first was based on a list of ten assertions about the user experience, in which the user should mark whether he fully agreed, partially agreed, did not agree or disagree,

partially disagreed or disagreed fully with the statements. Each position of agreement or disagreement was worth a score of 1 to 5, with 1 being the "totally disagree" and 5 being the "totally agree".
The second methodology was the SD, which uses a chart with ten pairs of antagonistic adjectives for the user to indicate, on a ten-point scale, which of the adjectives most qualifies the product. The score ranges from 1 to 10, and the end result is the sum of all averages of all pairs of adjectives. Each of the adjectives receives a rating between positive and negative, which must be done before the test application. The objective of the test is that the product be perceived with more positive characteristics as possible, so that your final score will increase.
The tests applied to the common opener had averages of 63 points (SUS) and 49.70 points (SD). These averages put this opener in a median position of performance, not excellent nor totally bad. By the SUS test, this opener had worse performance in the issues that involved the ease of handle and the quality of the material used in the product.
This result highlighted the following points as project guidelines: change in the type of handle to reduce muscle stress; Increase the area of contact between the user's hand and the product; Comfort to the user; Material change of the object.
From these guidelines came many alternatives, and the most appropriate was modeled in 3D and later made in the laboratory of the university by the team itself. The body of the object was constructed with eucalyptus wood, the can opener blade was removed from a product for sale on the market, and the bottle opener was constructed with a screw and two washers.

3 Results

The prototype was tested following the same methodology as the common opener test, and the results showed that in both tests there was an 11% improvement in the user's overall perception during can opener use. Individually, the SUS analysis shows six questions obtained higher scores than those reached in the first test, and the four that presented a decrease dealt with the formal design of the product, its manipulation, its format and its ease of use. In turn, the DS test also showed improvements. Of the twelve semantic pairs, seven had an increase in punctuation and a change in the adjective closest to the use experience. In this test, the prototype was perceived as hygienic, anatomical, attractive, ergonomic, sustainable, elaborate and desirable. All these adjectives were considered positive for this test, and they opposed the adjectives chosen for the common opener, which were all negative.
The SUS test indicated that the product is not so intuitive in its use, mainly because its format does not refer to any characteristic of the conventional model, which ends up confusing the user, since it automatically tries to reproduce the mode To which he is accustomed. It is necessary to eliminate this type of doubt so that the safety and comfort of the product are not compromised, and this will be considered in a later review of the project. As the format itself did not cause discomfort, we believe that a

possible solution to this problem of intuitiveness would be the construction of a holder that would induce the user to pick up the opener in the correct way.

4 Conclusions

The tests showed that there was a real improvement in the use experience associated with the can opener, something that could not have been quantified if the development of the project was not associated with the precepts of ergonomics. They also increased understanding of users real needs and product vulnerabilities, which proved to be essential for the development of a solution that was more appropriate, safe, and comfortable.

The improvement achieved was very positive, but the tests showed that there are still points that need to be rethought in order to avoid generating doubts and insecurity in users. In any case, the results generated by this prototype will be very useful for the development of even more refined solutions.

5 References

1. ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 10098: Folha de desenho – leiaute e dimensões. 1987. ABNT: Rio de Janeiro, 1987.
2. ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 10582: Apresentação da folha para desenho técnico. 1988. ABNT: Rio de Janeiro, 1988.
3. IIDA, I. Ergonomia: projeto e produção. Editora Blucher: São Paulo, 2005. 2ª edição.
4. MEDOLA, F O et al. Resultados Teste de Usabilidade 1. Bauru, 2016.
5. NORMAN, D. A. **O design do dia-a-dia**. 2006. Rocco: Rio de Janeiro, 2006.
6. PASCHOARELLI, L. C. Usabilidade aplicada ao design ergonômico de transdutores de ultrassonografia: uma proposta metodológica para avaliação e análise do produto. 2003. UFSCar: São Carlos, 2003. 142.
7. PASCHOARELLI, L. C et al. Usabilidade e seus diferentes enfoques no design ergonômico. In: _____. Ensaios em design: pesquisa e projetos. Canal 6: Bauru, 2013.

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