Virtual Tools Aid in Transportation: Usability Test of an Application for Cyclists from UFMA

Rubenio dos Santos Barros [1], Moisaniel Pimentel Filho [2], Lívia Flávia Campos [3]

DEDET – UFMA Av. dos Portugueses, 1966, São Luís, Maranhão, Brazil, 65.080-805

[1] rubeniobarros@hotmail.com, [2] moisa_filho@hotmail.com, [3] liviaflavia@gmail.com

Keywords: application, usability, participatory design

1 Context

The chaotic panorama of large cities regarding locomotion is well known and one of the major infrastructure problems in Brazil. The exacerbated appreciation of automobiles ends up overloading cities' road network and, together with a deficient public transport system, entails long hours of traffic jams, stress, loss of quality of life and loss to the economy resulting from the sacrificed production cost, which is the impact of long journeys from home to work, exceeding R$ 111 billion in all Brazilian territory (FIRJAN, 2015a).

In São Luís this reality can also be observed. According to data from the Firjan System (2015b), between 2011 and 2012 there was an increase in the average time spent on commuting in the metropolitan area of São Luís of 2.1%, going from 116 to 118 minutes spent on the commute to work.

In this scenario, an alternative has stood out as an effective way in different perspectives to overcome transportation problems: bicycles. To better enjoy the possibilities and benefits of this means of transportation, users tend to look for tools and information to facilitate this process. Among the tools, there are the social networks, which have been consolidated as a form of communication, collaboration and online work (LINDNER, ULBRICHT, PALAZZO, 2015).

In this way, this article aims to present a proposal of a collaborative virtual tool for cyclists from a Federal University Campus, respecting ergonomic and usability principles.

2 Method

For the application's elaboration the Participatory Design approach was used, and one of the techniques applied within this approach was the Card sorting, which is a tool

that elaborates a mental model of the users in a given information space (FRISONI and STEIL, 2005). In it, the participants order, hierarchize, name, group and classify data, from a given arrangement of cards (MORAES AND SANTA ROSA, 2012). In this stage, 8 individuals participated, which all of them fit the app's target audience. This step was accomplished using the online platform of research OptimalSort (OPTIMAL WORKSHOP, 2016).

From the results of Card sorting, the navigation map for the application was developed, enabling the construction of a wireframe, which according to Teixeira (2014), is a basic design of the structure of a certain interface with the purpose of demonstrating in a simplified way how the final product should work. After that, a prototype was developed.

For the evaluation of the prototype, a usability test was performed. Rubin (1993) apud Moraes and Santa Rosa (2012) points out that this tool tests functionalities at a more detailed operative level during the interaction of the participants with the interface when performing tasks previously elaborated. In addition, it was decided to use the Think-Aloud technique, where the user contributes and reports everything that he or she thinks, does or intends to do throughout the accomplishment of the tasks (MORAES AND SANTA ROSA, 2012). At the end of the usability test, the SUS technique - System Usability Scale (BROOKE, 1996) was presented to the participants to evaluate the efficiency of the application. For the SUS execution, six male participants, all of them considered representatives of the targeted audience.

3 Results

For the Card sorting, among the 8 participants it was observed age ranges from 17 to 46 years, being 4 men and 4 women. We presented 30 cards divided into 10 categories so that the participants of the survey could organize them in the way they thought fit. The results allowed the discovery of the proper vocabulary that should be used, which demanded the change of some terms for better understanding such as the change of the word "Help" for "Emergência" in the emergency section. The statistics results also guided the general structure of the functions and tasks provided in the app, creating six expansive categories.

Based on the Card sorting, the navigation map and the wireframe were obtained, which allowed the organization of the elements for the mobile platform, taking into account aspects like hierarchy of information on the screen, its structuring, weight, relevance and the relationship between other screens of the app (BUSARELLO, BIEGING and ULBRICHT, 2013).

Having approved the configuration of the wireframe, the creation of the graphical interface was started, taking into account aspects of Graphic Design, such as simplici-

ty, unity and standardization, reinforced by the graphic language that refers to the cycling atmosphere. As for the aesthetic quality, an approach associated with retro urban bicycles was chosen.

Considerations about ergonomics were also made, such as the concern about readability, the care with user's experience, the compatibility between tasks and users, among other concepts presented by Cybis, Betiol and Faust (2015), which were reiterated through the Participatory Design. The following images are some examples of the application interface (Figure 1):

Figure 1: Examples of the application interface.

For the usability test, the average time recorded for the tasks was (Table 1):

Completion of the registration	33,095 seconds
Sign in using the login screen	11,895 seconds
Report something	27,105 seconds
Report theft	14,741 seconds

Table 1: Task time log.

In general, it can be observed that the tasks were all executed in a short period of time, which indicates a quick understanding of the information and an adequate arrangement of the elements, something that was described by two individuals through the Thinking Aloud technique (MORAES and SANTA ROSA, 2012), who considered the interface practical and pleasant, with intuitive functions.

The error that was entered for resolution by the participants (log in error) was quickly resolved. The maximum time for detection, correction of error and access to home screen perceived among individuals did not exceed 15.03 seconds. The average time to complete all activities was 21.7 seconds.

From the calculation of the results of the answers according to what is proposed by the SUS technique (BROOKE, 1996), the table with the score of each participant and the final average was obtained, which is presented below (Table 2).

	Score by participant	SUS Score
Participant 1	36	90
Participant 2	39	97,5
Participant 3	40	100
Participant 4	38	95
Participant 5	35	87,5
Participant 6	36	90
	Satisfaction and usability index	**93,33**

Table 2: SUS results.

The results show a high level of satisfaction and usability, proving the efficiency of the participatory approach and the consistency and efficiency of the application.

4 Conclusions

The results demonstrate that the objectives proposed for the usability test were reached. The time to perform the tasks was also satisfactory, having an average duration of less than 30 seconds. The participatory design approach was a key element in the development of this work, through which important guidelines were obtained that contributed to the success of the usability test, such as the use of the Card Sorting technique for structuring information.

However, as indicated by the users through the Thinking Aloud technique, further studies are needed where the other elements of the application not currently loaded during the usability test are validated and the possible incompatibilities pointed out are remedied.

It is necessary to think more and more about cyclists' conditions, since the adoption of the bicycle for locomotion is a global tendency. And develop a structure, whether physical or virtual can help to make this transition more fluid and faster. The application proposal presented here aimed to reinforce this thinking and stressed the importance of considering user's participation throughout the design process.

5 References

1. BROOKE, J. SUS - A quick and dirty usability scale. Usability Evaluation in Industry: Earley, 1996.

2. BUSARELLO, R. I.; BIEGING, P.; ULBRICHT, V. R (Org.). Mídia e educação: novos olhares para o aprendizado sem fronteiras. Pimenta Cultura: São Paulo, 2013. 172 p.
3. CYBIS, W.; BETIOL, A. H.; FAUST, R. Ergonomia e usabilidade: conhecimentos, métodos e aplicações. Novatec: São Paulo, 2015. 496 p.
4. FRISONI, B. C.; STEIL, V. Como estruturar melhor a área de contato com o usuário? A utilização da Técnica de *Cardsorting* para desenvolver a estrutura do website do Núcleo de Inovação em design da Cadeia Têxtil. CONGRESSO INTERNACIONAL DE ERGONOMIA E USABILIDADE, DESIGN DE INTERFACES E INTERAÇÃO HUMANO-COMPUTADOR: Rio de Janeiro, 2005.
5. LINDNER, L. H.; ULBRICHT, V. R.; PALAZZO, A. M. Análise da interface padrão do Oxwall como plataforma de rede social. Brazilian Journal of Information Design: São Paulo, [2015].
6. MORAES, A. de; SANTA ROSA, J. G. Design participativo, técnicas para inclusão de usuários no processo de ergodesign de interfaces. Rio Book's: Rio de Janeiro, 2012.
7. OPTIMALSORT. Optimal Workshop: Wellington, 2016.
8. SISTEMA FIRJAN. O custo dos deslocamentos nas principais áreas urbanas do Brasil. FIRJAN: Rio de Janeiro, 2015a.
9. SISTEMA FIRJAN. O custo dos deslocamentos nas áreas metropolitanas: Estado do Maranhão. FIRJAN: Rio de Janeiro, 2015b.
10. TEIXEIRA, F. Introdução e boas práticas em UX Design. Casa do Código: São Paulo, 2014.