

Safety in Focus

Communicating user requirements through design concepts

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In Gothenburg approximately 300 accidents involving falling in public transportation vehicles are reported annually. This paper presents the work of investigating the problem situation as well as illustrating and communicating the user requirements through design concepts of tram and bus interior. In earlier projects initiated by the assigner a list of user requirements has been the final result. There has, however, been difficulties regarding transforming the requirements into solutions. Therefore, in this project, design concepts were developed in order to illustrate the requirements. This gave a more holistic and less traditional view of possible solutions to the problem.

Accidents, Design for Elderly, Illustrating and Communicating Requirements, Public Transportation.

1 Introduction

In order to include all citizens of Gothenburg in the public transportation system a redesign project has been initiated by the City of Gothenburg together with additional operators involved in the public transportation. One part of this work is to reduce the probability of accidents involving falling when travelling with public vehicles as well as to minimize the injuries in fall situations. Approximately 300 accidents of this kind are reported every year, but studies described in this paper indicate that many accidents and incidents are never reported (Appelfeldt and Nätterlund, 2007).

2 Objectives

The scope of this paper is to present the work of investigating the problem situation and illustrating the requirements in design concepts of tram and bus interior. Additionally the effects of presenting design concepts rather than problem descriptions and lists of requirements are discussed.

3 Procedure

In order to analyse the causes and risks of fall accidents and to create a picture of the travellers risk perception several different studies were made; including study of incident reports, semantic analysis, observations, individual interviews, field interviews, focus group interviews and risk analysis. The result of this investigating phase was a picture of the, in many ways complex, situation and the factors behind a fall situation. The study shows that fall accidents are most likely to occur when embarking and disembarking the vehicle, and during ticket validation. Furthermore, accident reports show that most fall accidents involves elderly people. Interviews confirmed this picture and also indicated that elderly people were more afraid of fall accidents and that this restricted their travelling by public transport.

In earlier projects initiated by the assigner a list of user requirements found during the investigating phase has been the final result. There has, however, been experienced that there are difficulties regarding transforming the requirements into solutions. In this project, however, the process was decided to be taken one step further.

With the purpose to illustrate the requirements, the investigating phase was followed by a design phase in which interior concepts were developed. This was partly made by industrial designers in a workshop where the designers first got a presentation of the problems found and then got one day to work with different creative tools in order to come up with innovative solutions. These solutions were then further developed by the authors. Both holistic interior concepts, such as rearranging of furnishing layout, and detail solutions were developed. Different solutions give opportunity to prevent accidents on different levels of the event chain, from arranging the furniture so that the passengers quickly can reach an empty seat to reducing hard surfaces that might hurt a falling person. Finally the different concepts were visualized in sketches, CAD and physical models (Engelbrektsson et al. 2006)

When presenting the concepts to the assigner focus was on giving clear motivations and descriptions of the principles behind the design concepts. Two examples of illustrations of requirements will now be described and discussed.

Example 1 - Support when moving

One of the requirements for the vehicle interior in order to minimize fall accidents were that there should be hand support within reach throughout all of the vehicle to support movement. Previous experience have told that this is interpreted as “as many poles as possible”. To get the assigner to think in another direction the following examples of solutions were presented.

1. Chairs turned towards the windows opens for handlebars integrated in the backrest. (Figure 1)
2. Assymetric interior with seating in one side of the vehicle and the corridor in one side making it possible to fit a handle throughout the vehicle. (Figure 2)

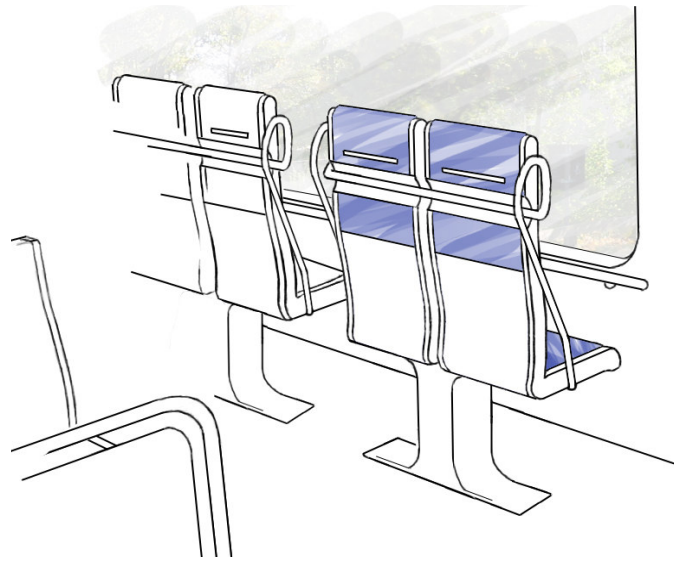


Figure 1: Chairs turned against the windows allows for a handlebar integrated with the back of the chair.

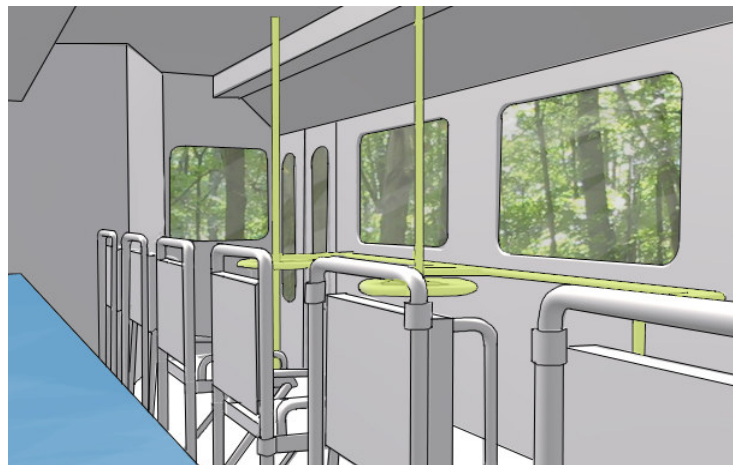


Figure 2: Asymmetric interior is another way to create natural spaces with handles.

Example 2 – Support when standing

Another example is that of support when standing. The common solution used is leather straps in the ceiling. These have several shortcomings, firstly they do not support the body very well, ideally support should be provided at hip-height. Secondly people find standing with your arms stretched upwards can make you feel uncomfortable because it allows other passengers to get too close for comfort.

Instead of leather straps two different types of support for standing was developed (Figure 3 and Figure 4). One intended for placement along one of the walls, and one that could be placed in the current standing areas.

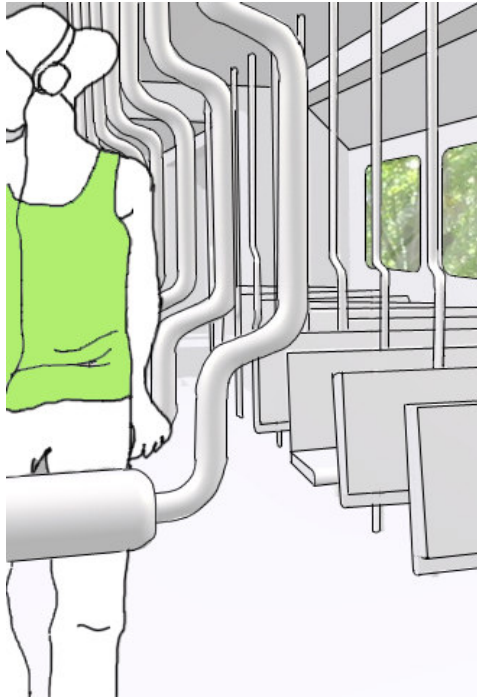


Figure 3: Support for standing gives support at the right height and also provides the passengers with their own space



Figure 4: A Support for standing developed to give standing passengers of different length support at hip-height.

4 Discussion and conclusion

When presenting the work to the assigner it was experienced that the concrete solutions made it easier for the assigner to understand how the users' requirements could be transformed into solutions. Focus was moved from problems to possibilities and solutions. It also gave the assigner a more holistic and less traditional view of the problem and the possible solutions. For example, the requirement for support while standing and moving around in the vehicle traditionally has resulted in forests of metal poles. Now, with the different solutions connected with the requirement, the discussion with the assigner moved to how to implement the different solutions to the current vehicles etc.

However, there seemed to be a risk that the solutions are taken as ultimate, rather than illustrations of the underlying principles of design. This led to the discussion of the underlying principle becoming rather brief and the discussion about the solution becoming somehow too detailed. Two different solutions to this problem is suggested. Several different design suggestions must be presented in order to communicate that they are indeed suggestions and the origin of the design suggestions must be clearly stated.

5 References

Appelfeldt Rebecca, and Nätterlund Karolina, 2007, *Med fokus på säkerhet - - analys och konceptutveckling av spårvagnsinteriör*, Examensarbete Chalmers tekniska högskola, Gothenburg, Sweden, 2007

Engelbrektsson P., Nätterlund K., Appelfeldt R., Wikström L., Blidgård L-O, *Fallolyckor i kollektivtrafiken – En studie inom Kollaprojektet*, Rapport, Avd Design, Chalmers tekniska högskola, Gothenburg, Sweden, 2006