Summary

Background

This report presents the process of a bachelor thesis of the study Industrial Design at the University of Twente. The assignment is executed commissioned by TNO at the department Equipment for Additive Manufacturing. TNO is targeting to take additive manufacturing to a higher level. The goal of the assignment is to make a conceptual prototype of an exoskeleton which is produced using additive manufacturing. The exoskeleton should assist elderly with the sit-to-stand transition.

Approach

The assignment is executed in four different phases. First the analysis phase in which market research is done, the stakeholders are analysed and literature research is done. The analysis phase results in a list of requirements. These requirements are used in the second phase, the concept phase. Three concepts have been developed and have been rated based on the requirements. The concepts have been improved into one final concept. This concepts is then turned into a prototype which brings us to the third phase. The validation phase, in this phase the concept is validated by a user test and theoretical evaluation. The points of improvement that are found in the validation phase are then used in the final phase, the final product design. In this phase a redesign is made which incorporates the points of improvement.

Results

An innovative solution was found that satisfies most requirements. The final product is a knee brace that helps elderly with the sit-to-stand transition. The product is a form fitting design with an incorporated hinge which can be 3D printed together with the product.

Conclusion

By making the exoskeleton a form fitting knee orthosis all requirements set in the analysis phase are met or can be met with further development. Therefore the recommendations were drawn up which can be used in the continuation of the development process.