



INCLUSIVE LIFE
HEIGHT ADJUSTABLE WHEELCHAIR SEAT

"A KEY COMPONENT TO WHEELCHAIR DESIGN IS USER MOBILITY; A FUNCTION THAT GETS COMPROMISED BY MOST STANDING FRAME DESIGNS IN THE ELEVATED POSITION. THIS DESIGN STILL ALLOWS THE USER ACCESS TO THEIR WHEELS IN THE ELEVATED POSITION WHICH IS A TREMENDOUS BENEFIT."

DOUG GARVEN
INDUSTRIAL DESIGNER AT TILITE WHEELCHAIRS
SEATTLE, USA

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Category: Physical
Name: JD Sherman



PROJECT OVERVIEW

Category: Physical

INTRODUCTION

My name is JD Sherman and I'm a 4th year industrial design student at Carleton University. For my thesis project I have been developing a height adjustable wheelchair seat that can be installed into any existing rigid frame wheelchair on the market. It has been my goal to address physical barriers to accessibility through a concept that empowers people to live a more inclusive life. The seat allows people to reach for higher cupboards and overhead appliances, converse with individuals at eye level, and use higher work and kitchen surfaces which were previously inaccessible. The concept has been developed with the help of many end users that have constructively critiqued and tested numerous prototypes that have led to the validation of the final concept.

Regards,

JD Sherman

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MARKET DIFFERENTIATION

NO PRODUCT LIKE IT ON THE MARKET TODAY

CURRENT PROBLEM

There are three key pain points identified in the current standing wheelchairs on the market today. The first problem is that they are expensive, reaching upwards of \$12 000. This is problematic when the average income of the end user is approximately \$20 000 annually. Another pain point is the neglect to maintain the seat slope. This means that an individual with limited trunk strength must depend on the belting system to hold them in place which is uncomfortable and undesirable. The last issue is perhaps the biggest issue from the end user's perspective. Once standing in the chair, the person is stuck in that position until they come down and reposition. For a person in a wheelchair, mobility is far more important than height adjustability and is not worth the tradeoff.

LEVO STANDING WHEELCHAIR



1. EXPENSIVE

COSTS \$8 000 - \$12 000

2. NO SEAT SLOPE

NEGLECTS THE NEED FOR A MAINTAINED SEAT SLOPE

3. NO MOBILITY

ONCE RAISED UP THE USER CAN NO LONGER MOVE AROUND

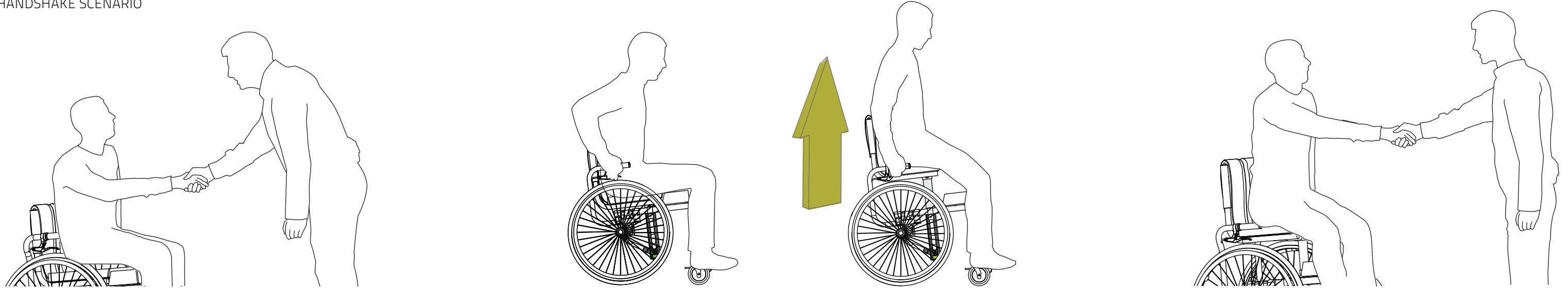
MARKET DIFFERENTIATION

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THE SOLUTION

Introducing a breakthrough in wheelchair design. A new height adjustable seat that gets installed into your existing rigid frame chair and you can install it yourself! The height adjustable seat functions differently than any other product on the market to date. Offering eight inches of height adjustment, the seat cushion is uniquely divided into two sections so that as the pneumatic cylinder rises, only the back portion of the cushion goes up. This is to ensure that the preferred seat slope is maintained at all times without forcing your knees up, so that your feet remain on the foot plate. The seat slope is what gives individuals with limited trunk strength the feeling of comfort and a sense of security.

HANDSHAKE SCENARIO



1. AFFORDABLE

SIMPLY PURCHASE THE INCLUSIVE LIFE SEAT AND INSTALL IT TO YOUR EXISTING RIGID FRAME CHAIR

2. MAINTAINS SEAT SLOPE

YOU WILL ALWAYS FEEL SAFE AND SECURE BECAUSE THE SEAT SLOPE IS NEVER ALTERED

3. ALWAYS MOBILE

MOBILITY IS NEVER COMPROMISED. EVEN AT FULL EXTENSION YOU CAN ALWAYS REACH YOUR TIRES AND MOVE.

4. INSTALLS INTO ANY CHAIR

INTELLIGENT DESIGN ALLOWS THE SEAT TO BE INSTALLED INTO ANY RIGID FRAME WHEELCHAIR.

SEAMLESS INTEGRATION

INSTALLS ONTO ANY RIGID FRAME CHAIR

INSTALLATION

The Inclusive Life Height Adjustable Wheelchair Seat can install into any existing rigid frame wheelchair on the market. The clamps come with plastic gaskets that can afford any tubing diameter your wheelchair frame may have. The only parts that are not standardized are the chassi arms which are bent for each order dependent upon the seat width of the wheelchair. These standardized parts allow manufacturing costs to be reduced which results in a more affordable product for the end user. Once the seat is ordered, the user can remove their existing cushions and install the Inclusive Life Seat all within an hour using two allen keys, a wrench, and a pair of wire cutters.



1. CHASSI ASSEMBLY

ATTACH CHASSI ARMS TO CHASSI AND FASTEN TO THE WHEELCHAIR FRAME WITH THE ALUMINIUM CLAMPS.

2. INSTALL ARMRESTS

PLACE THE ARMREST CLAMPS ON THE FRAME AND THEN SLIDE THE ARMRESTS IN AND FASTEN.

3. CYLINDER SLEEVE & BRAKE CABLE

INSTALL THE CYLINDER SLEEVE AND LINK UP THE BRAKE CABLE TO THE BOTTOM OF THE CHASSI.

4. INSTALL SEAT AND CUSHIONS

GUIDE THE CYLINDER THROUGH THE SLEEVE UNTIL IT SECURES INTO THE CHASSI.

USER CENTERED FUNCTIONALITY

A PRODUCT FOUNDED IN RESEARCH AND USER TESTING

USER TESTING

Physical prototypes allow users to functionally explore and test concepts in a unique way that CAD modeling and FEA testing can't. Over the past five months, over seven prototypes have been developed that have led to the validation of the height adjustable seat concept. Over twenty participants have tested the working prototypes and have insightfully commented on the overall experience, functionality and comfort of the product. The new seat design successfully lifts users up without altering the seat slope and without raising the user's feet off of the foot plate.



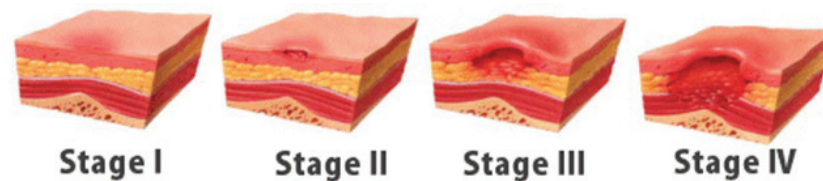
POTENTIAL MARKET

THE BENEFITS TO HEALTHCARE

PRESSURE SORES

One of the largest problems in retirement homes is the development of bed sores as patients remain in one position for extended amounts of time, causing oxygen and blood to be cut off from specific pressure points initiating the deterioration of skin. During an interview with a medical professional, they mentioned the problem of bed sores and cautioned me to be aware of the issue in the development of the product. Being bedridden or confined to a wheelchair are factures that increase the risk of pressure ulcers. Not only can skin deterioration occur from pressure, but also from shearing, as adjacent surfaces slide across one another. "As friction is applied to the skin, the outer protective layer is rubbed away. The soft moist layer of skin is then exposed which allows bacteria to enter (PHC-online, n.d.)". The skin starts as a reddened area and eventually blisters. The skin then breaks down and looks like a crater. Eventually the wound becomes so deep that it actually damages the muscle and bone (Zieve, 2011). Pressure ulcers are so serious because if infected, the infection can spread throughout the body. Dealing with a user group that potentially has no feeling in their lower limbs eliminates the ability for the user to identify the pressure points themselves and readjust accordingly. Appropriate design of the seat is therefore imperative.

STAGES OF PRESSURE SORE DEVELOPMENT



It's recommended that people change position every two hours to prevent pressure sores from developing. The Inclusive Life Seat can reduce the risks of pressure sores because the seat allows for quick repositioning whenever the user desires. The seat also improves blood flow in the users legs as they sit in the raised position.

FUTURE DEVELOPMENT

MULTIPLE APPLICATIONS

ALTERATIONS

Currently, the Inclusive Life Seat uses a pneumatic cylinder to raise the seat, which still requires the user to push themselves up using the armrests. It's worth considering the benefits of installing an actuator instead of a pneumatic cylinder that could lift the user up with the push of a button.

If the clamps were further developed so that the Inclusive Life Seat could attach to a folding hospital chair, this seat would assist in the transferring of patients out of their wheelchair. In the raised position, the caregiver is able to get an arm underneath the patient because of the unique split design of the cushion where only the back portion of the seat comes up.

REHABILITATION

This product can act as an important transition point from being in a wheelchair after an accident to learning how to walk again. As the seat raises up, the user can choose to either sit back in their chair, or lean slightly forward and transfer weight onto their legs. This allows the muscles in the leg to engage so as to grow in strength while the individual may not be ready to take their first step.

USER EXPERIENCE VIDEO

IT'S ALL ABOUT A MORE INCLUSIVE LIFE

ONLINE VIDEO

Enter in the URL address and the password to view the two minute clip of the user experience.

<http://vimeo.com/63133551>

Password: **inclusivelife**

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