

Wheelchair Pod-car Transformer (WPT)

Executive Summary

The WPT is an autonomous and electrically powered wheelchair that can transform into a pod-car. It provides independent, convenient and safe transportation for the mobility impaired citizens, aiming to push the boundaries of limitations set by age and disability.

PROBLEM

Mobility constraints of the elderly and the disabled lead to lack of independence and inconvenient lifestyle.

- Immobility & Lack of Independence: 88.4% of people with disability prefer private modes of transport - Australian Monash University. The majority of mobility impaired citizens are reliant upon family/friends just to go out. In addition, special disability transportations are also required.
- Safety issues: One of the most popular mobility aids is the mobility scooter but the fall injury rate for older Australians from scooters had increased by 150% over the last decade – AIHW

PRODUCT

The WPT is multifunctional (3 modes) and autonomous using transforming mechanisms and AI technology. Mode 1: All-terrain wheelchair with stair-climbing ability + barrier-free indoor and outdoor. Mode 2&3: semi or full-enclosure for shelter from weather conditions + safety on bike lanes/road

OPPORTUNITY

The Australian Bureau of Statistics states that currently Australia has a population of 15% people aged over 65, and our aging population is growing. In addition, 6.9% of Australians use wheelchairs and mobility aids – AND.org.au

- Potential market of 21.9% (5.4 million) → projected to be over 26.8% of Australians in 18 years by the Australian Institute of Health and Welfare.
- Plus, leasing to people with temporary disabilities

The WPT is a niche product with only indirect competitors being autonomous cars, Scewo stair-climbing wheelchair and mobility scooters. The WPT integrates their functionalities into one unique product with transformable enclosures.

TECHNOLOGY - Existing Technology Utilised

Safety:

- AI driverless technology using 4 cameras (360 degrees high resolution imaging), 4 RADAR (2 short-range and 2 long-range) and 1 LiDAR sensor (3D scanning) → speed control and eliminate human error



Contact Information

Willoughby Girls High School

School Year

Year 10

Subject(s)

ISTEAM

Development Stage

Start-up

Number of Team Members

4 – Karina, Sanaz, Brooklyn, Chris

Prototype

Transformation modes of WPT:

1. Wheelchair
2. Semi-enclosed
3. Fully-enclosed



- **Airbags in the back, side and front covers triggered by piezoelectric sensor +**
Durable material for the covers (carbon fibre + acrylic plastic windows)

Mobility:

- GPS system activated using in-built voice recognition technology (Google Assistant/Siri), touch screen and electronic braille accommodating visually and physically impaired users + All-terrain tracks for various ground surfaces and maximised mobility
- Electric motor with versatile charging mode compatible with household power outlets

Comfort:

- Rotatable covers with interlocking mechanisms for coverage from adverse weather conditions and comfortable cushioned seats

SUSTAINABILITY

- Social:**
- 1 million disabled people (AND.org.au) + 1 in 8 elderly currently employed (NCVER). The WPT Supports their engagement in the society → increased productivity
 - 4.4% of Australia's population are wheelchair users and have experienced depression at some point in time. Independent mobility will improve mental health by reducing isolation.
 - No major infrastructural changes required: Space efficiency due to small and compact size, the WPT can travel on existing bike lanes

Environmental: Reduced emissions and toxic chemical waste with electrification:

- Aim to decrease: 383.3 megaton of Australia's annual carbon emissions due to vehicle exhausts – Dr.Saddler at ANU (2017)

Financial: Affordable pricing and low maintenance cost

INVESTMENT

- Funding commitment in the form of lab access with R&D capabilities: to repurpose existing technologies and prototype the product for user testing
- Government support/partnership:
 - Legal classification & licencing of the WPT to allow access on roads and in buildings
 - Legislative changes: renaming bike lanes to mobility lanes will allow WPT & mobility aid users and bike riders to travel with safety and equality + more mobility lanes needed

Two Potential Revenue Models:

1. Private ownership: WPT will be sold at approximately \$11,250 based on the fact it is one third in weight of an electric vehicle, with the cheapest electrical vehicle ≈ \$28,000. The cost to manufacture our product is around \$9,000, and so a \$2,250 profit would be made for each WPT sold.
2. Mobility as service/Leasing program - based around normal car & mobility aid leasing models: Flat rate weekly charge with insurance would be about \$50 per week for temporary leasing arrangement, which means that we could get a return of our investment for one vehicle in about 3.5 years.

