

# DESIGN AND FABRICATION OF MULTI PURPOSE WHEEL CHAIR

**Project Reference No.:** 49S\_BE\_5575

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## **Keywords:**

A metal frame (GI/Mild Steel), motorized or manual mechanisms (rack & pinion, levers), and ergonomic design for improved patient handling and comfort.

## **Introduction:**

A wheelchair is a vital mobility aid for people with physical disabilities or limited mobility. Traditional wheelchairs provide basic movement but often lack multifunctional features that enhance comfort, independence, and usability. With increasing demand for adaptable and user-friendly assistive devices, designing a multipurpose wheelchair that combines mobility, safety, and additional functions such as reclining, lifting, or even small storage features becomes essential. This project focuses on creating a wheelchair that not only provides mobility but also improves the quality of life for users by integrating multiple practical functions.

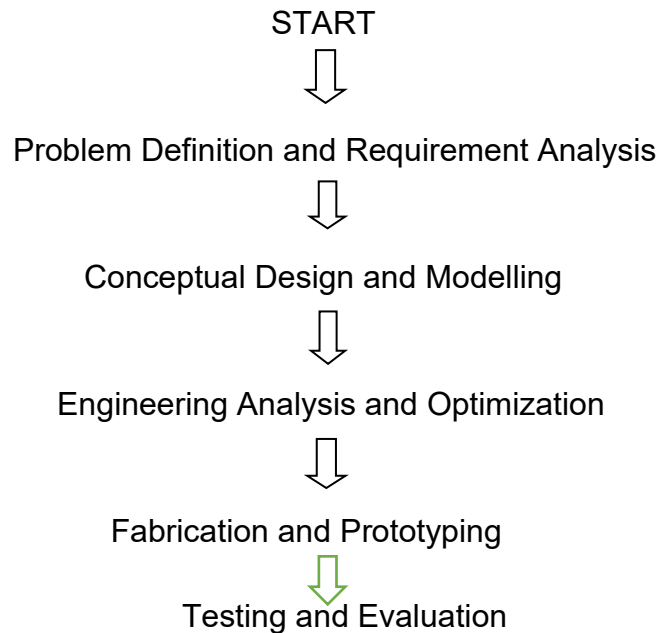
Older adults are the most prevalent wheelchair users in Canada. Yet, cognitive impairments may prevent an older adult from being allowed to use a powered wheelchair due to safety and usability concerns. To address this issue, an add-on Intelligent Wheelchair System (IWS) was developed to help older adults with cognitive impairments drive a powered wheelchair safely and effectively. When attached to a powered wheelchair, the IWS adds a vision-based anti-collision feature that prevents the wheelchair from hitting obstacles and a navigation assistance feature that plays audio prompts to help users manoeuvre around obstacles. Nowadays more than 700 million persons around the world have disability or handicap. During the last decades, the elderly population in most of the European countries and across all the most civilized countries is also growing at an increasing pace.

## **Objectives:**

1. To design and development of Design and Fabrication of Multi-Purpose Wheel Chair.
2. To design a wheelchair that enhances mobility, comfort, and independence for differently-abled individuals.
3. To integrate mechanical and electrical systems for multipurpose functions like lifting, reclining, and movement.
4. To develop a cost effective and user-friendly wheelchair suitable for both indoor and outdoor use.

5. To ensure safety, durability, and ease of control through design and fabrication.

### Methodology:



**Fig.1.:** Methodology

The methodology for designing and fabricating a multipurpose wheelchair involves a systematic approach: identifying user needs (e.g., patient shifting, mobility), creating 3D CAD models (SolidWorks/AutoCAD), selecting materials (steel/aluminium), and fabricating via cutting, bending, and welding (TIG/MIG). Key features often include motorized movement, rack-and-pinion mechanisms for stretcher conversion, and adjustable, ergonomic structures

### Component Required:

- Mild steel square bar
- Caster wheel
- Cushion
- Hinges
- Ply wood sheet
- M S plate

### Result and Conclusion:

1. The wheelchair prototype is tested in controlled indoor environments on flat and slightly uneven surfaces. Each function—mobility, vacuum, mopping, and absorption is individually evaluated, followed by combined operation tests. Measurements include cleaning efficiency, manoeuvrability, power consumption, and user comfort. Performance Evaluation Performance parameters such as ease of movement, cleaning efficiency, stability, and ergonomic comfort are recorded. Observations are compared with design expectations to identify areas for improvement.

2. Vacuum Mechanism Testing The vacuum unit is tested on dust and small debris. Efficiency is measured by the amount of dirt collected per pass. Results indicate effective suction with minimal power consumption and stable operation without vibration interference. Mopping Mechanism Testing The mopping pads are evaluated on wet cleaning effectiveness. Tests show even water distribution and efficient floor cleaning, with the absorption module preventing spillage. Optimal pad speed and water flow are noted.

### **Conclusion:**

The conclusion for a multipurpose wheelchair design is that the final product successfully meets its goals of enhancing user independence and caregiver efficiency through features like improved mobility, safety, and multi-functionality. The design is verified by structural and kinematic analysis to be safe and stable, and its cost-effectiveness and ease of use are shown to be beneficial for both users and caregivers. Future improvements could focus on further user interface adaptation and integration of advanced technologies.

### **References:**

1. A Review on Design and Fabrication of Multiutility Wheelchair – Desai R. Patel A. S., Kumar L. (2017). Available at: <http://www.ijirst.org/articles/IJIRSTV3I10055.pdf>
2. Design & Fabrication of Manual Wheelchair from Corrugated Cardboard Sheets - Sharma P Mehta V. Dhaigude S., Agarwal R. (2018). Available at: <https://www.ijert.org/research/design-and-fabrication-of-manual-wheelchair-from-corrugated-cardboard-sheets-IJERTV7IS050250.pdf>
3. Smart and Automated Wheelchair - Gupta S Khan M and Verma R (2019). Available at: <https://ir.uitm.edu.my/id/eprint/36469> IJIREEICE,
4. Multipurpose And convertible Design Wheel Chair – Ramesh K, Rajan p, Arjun V, (2021) in DOI: 10.17148/IJIREEICE.2022.10515. <https://ijireeice.com/papers/design-fabrication-multipurpose-wheel-chair/> Available at:
5. A Review on Design and Fabrication of user Comfort Wheelchair – Das S., Roy B V. And Chatterjee P (2017). Available at: <http://www.ijirst.org/articles/IJIRSTV3I10055.pdf>

### **Future Scope:**

1. This project has demand in the hospitals for space constraints.
2. Mechanism and future electronics system have a huge demand for automation.
3. This project can be implemented for sensors to observe the human health behaviours. Like heart beat sensors plus raise and drop detection.
4. Physically Disabled People can use it as per their purposes. People who are able to use their hand can use this to travel around.
5. People suffering from certain paralysis, high conditional fever can use either chair or converted bed for resting purpose as per requirement.
6. Old Age Homes People at old age homes can use this chair for both purposes