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Improvement of the life quality  
of children with cerebral palsy –  
design of specialized wheelchair

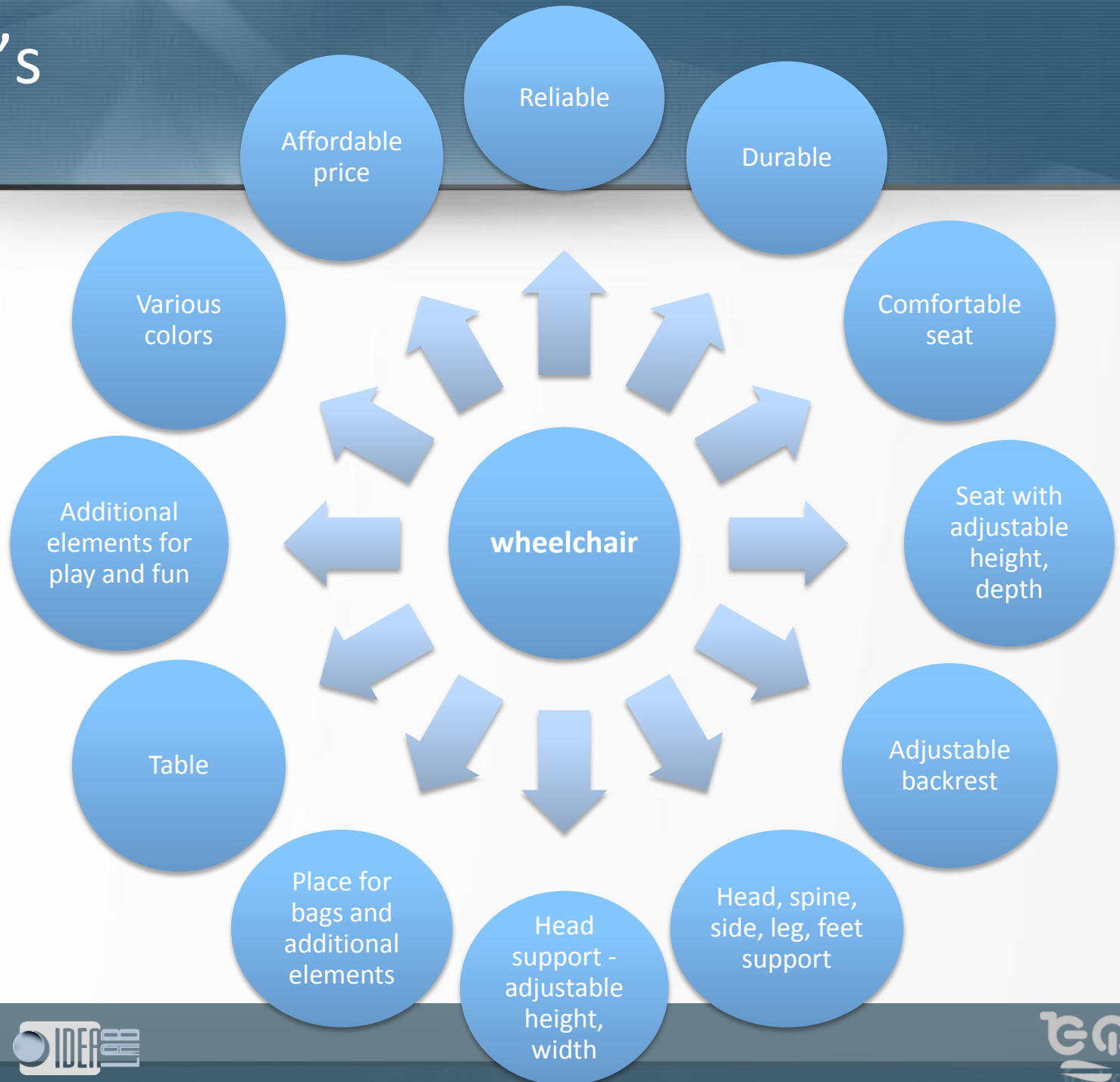
# Introduction

- What is cerebral palsy?
  - Cerebral palsy is a result of brain injury, which produces impairments of the locomotion system, balance and coordination of the body.
- Need of specialized wheelchair.
- **Conducted analysis:**
  - Analysis of the children's needs,
  - Analysis of the medical, customer and manufacturer requirements,
  - Analysis of the proposed solution.

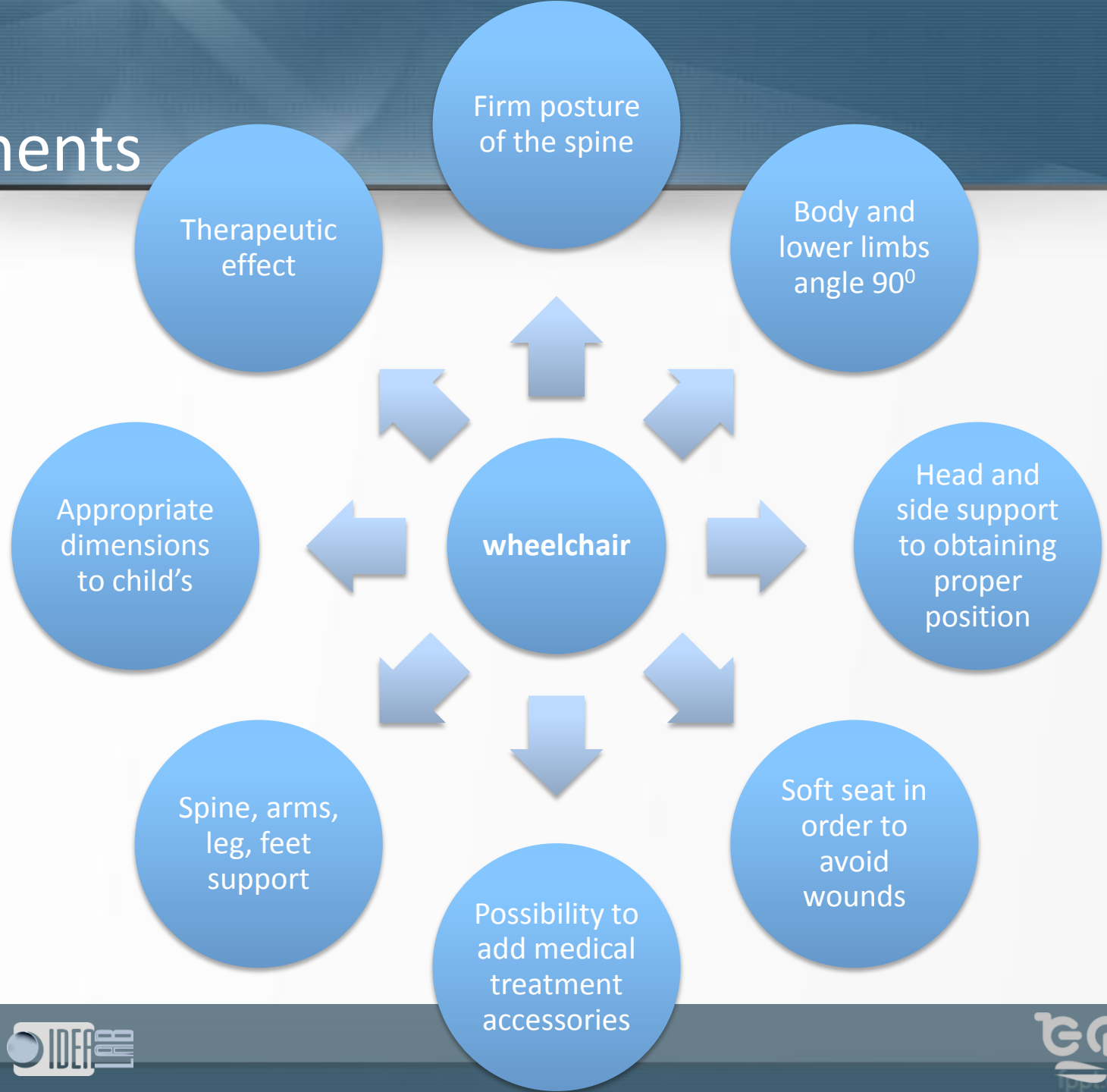
# Characteristics of children with cerebral palsy

- Forms: spastic, athetoid, ataxic
- 80% - speaking problems and impaired visual activity
- Cognitive impairment
- Often accompanied by epilepsy
- Additional disorders

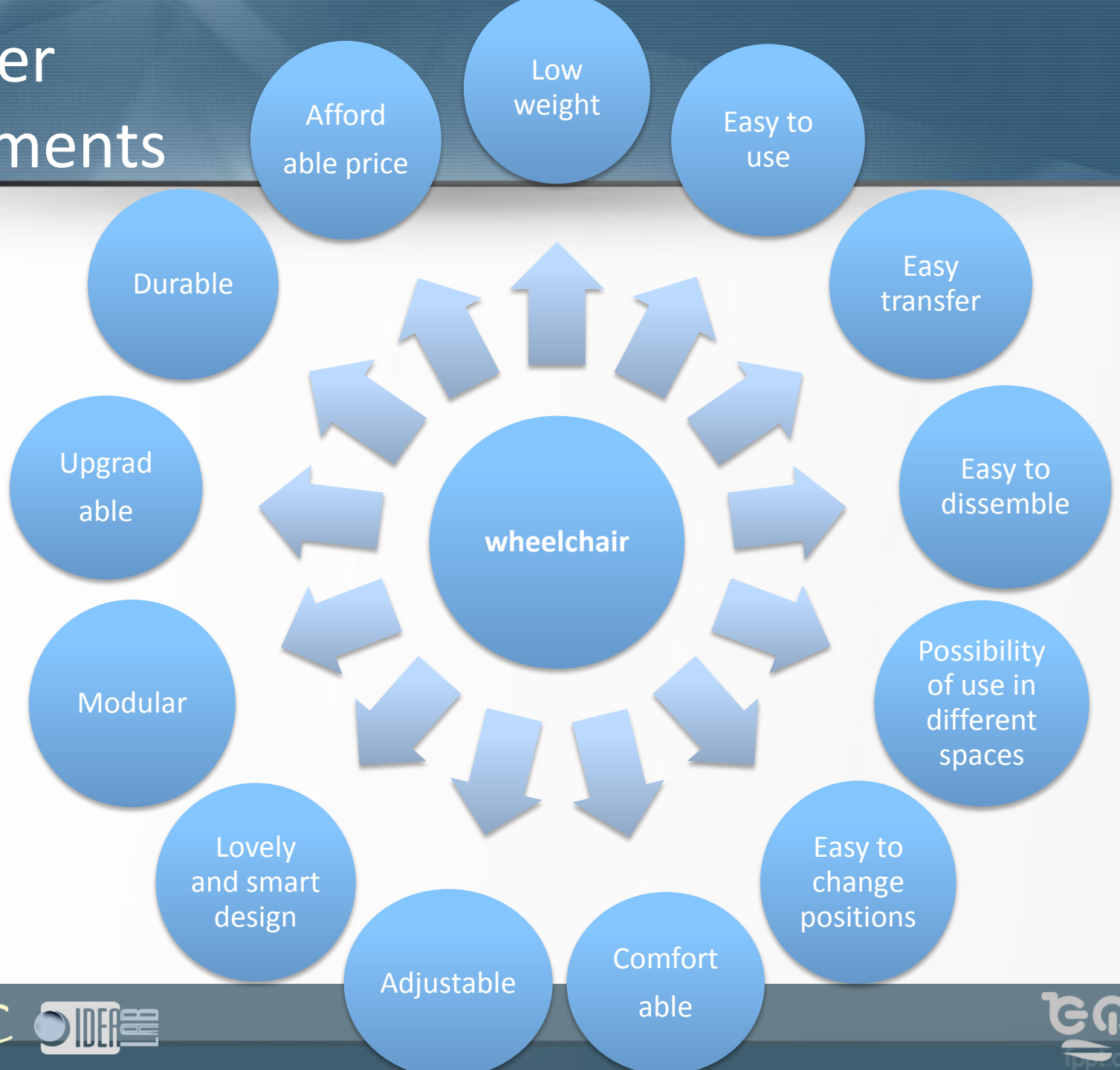
# Children's needs



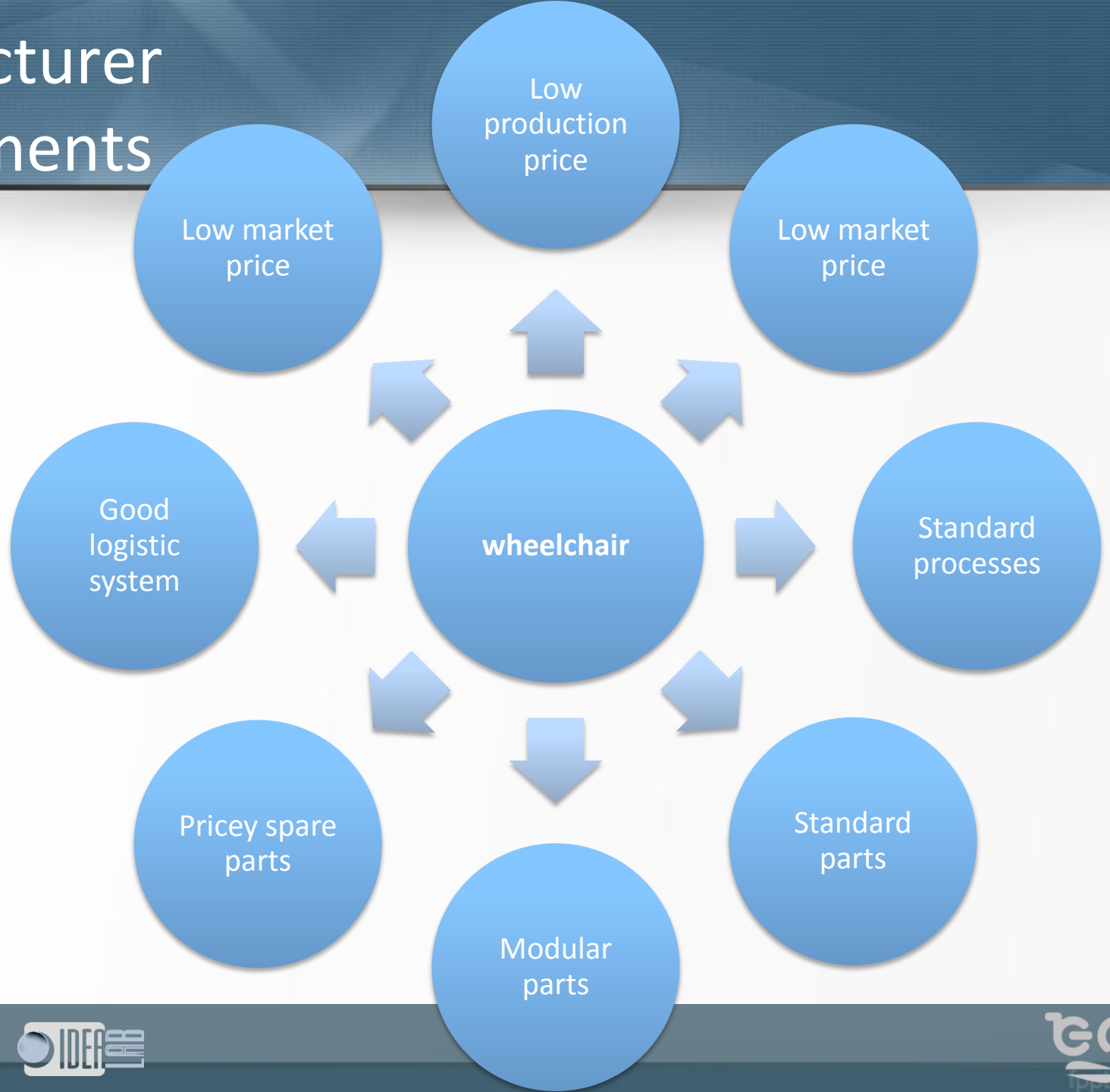
# Medical requirements



# Customer requirements



# Manufacturer requirements



## Ergonomic requirements for the wheelchair

- Possibility to change driving system;
- Possibility of having storage space;
- Good suspension system;
- Adjustable handles for companion's manipulation.

## Ergonomic requirements for the seat

- Seat and backrest angle must be  $90^{\circ}$  (usual active position);
- Adjustable backrest inclination in order to provide rest position ( $90^{\circ}$ - $120^{\circ}$ );
- Possible transformation into standing support;
- Obligatory integrated armrests for placing the arms in rest position;
- Obligatory possession of additional supports for providing vertical position of the spine;
- Obligatory integrated feet supports for stabilization of the body;
- Obligatory integrated legs supports for stabilization of the body in standing position;
- Obligatory integrated headrest for obtaining proper position of the head;
- Obligatory possession of a wedge (between the thighs in order to prevent of spasms);
- Soft seat cushions to prevent wounds occurrence;
- Dimensions of the seat must be appropriate for the child's dimensions.



# Design concept

- Design problem
  - Design a wheelchair for a children with cerebral palsy, age 7-14.
- Concept of modular wheelchair
  - Fixed seat
  - Variable driving system



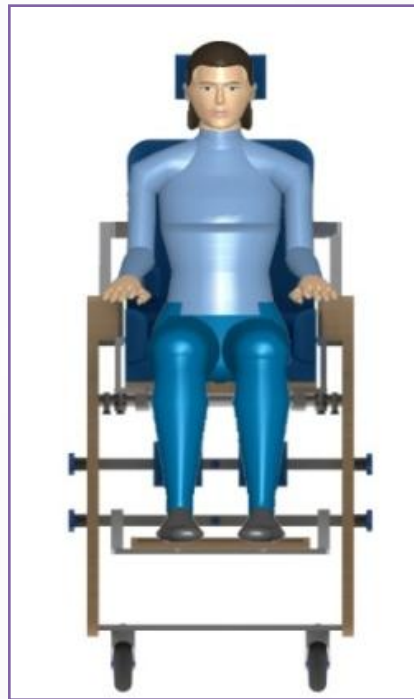
# Design concept

- Concept of adjustable seat
  - Principal of modularity and
  - Principal of adjustability,
- Transformation of the wheelchair into a standing device.



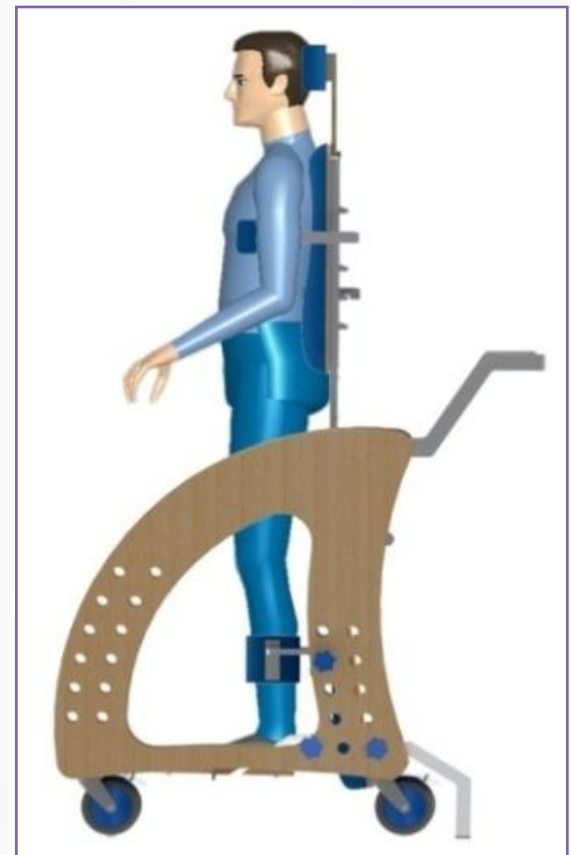
# Analysis of the design – first evaluation

- Verifying wheelchair comfort for child, age 7.



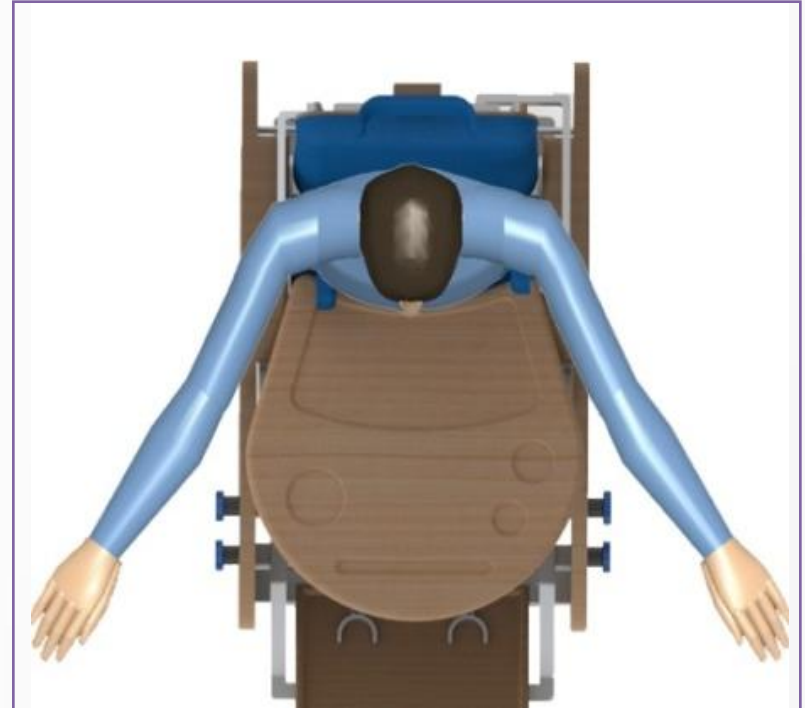
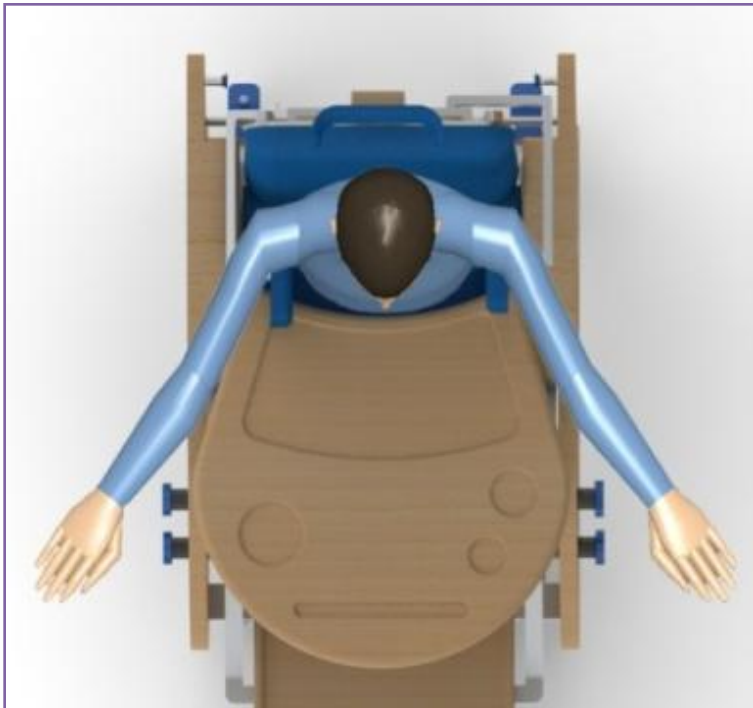
# Analysis of the design – second evaluation

- Verifying wheelchair comfort for child, age 14.



# Analysis of the design – third evaluation

- Verifying the zones of convenient reach for the children age 7 and 14 in seating position.



# Instead of a conclusion

- If you really want to do something, you'll find a way. If you don't, you'll find an excuse.

– Jim Rohn

