

PATIENT MOVING DEVICE 2.0

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ABSTRACT

Wheelchair is an equipment use to facilitate movement for patient that incapable to walk. Wheelchair is widely used at hospitals, elderly care centers, and also home. The wheelchair's user mostly account with the difficulty to move and transferring from places such as from bed to wheelchair and if a career or nurse is presence, a lot of energy and strength is needed to help lifting the patient. In some situation, wheelchair is also used by patient to help them taking bath.

Traditionally, a wheelchair can only be used as a transportation for a patient in a sitting position only and sometimes they needed the help of somebody to push the wheelchair. Nowadays, wheelchairs are manufactured in various design to serve various functions and some are even have motorized controller. The most widely adopted materials of the project are mild steel due to the durability of the patient's weight and have other similar materials identical to the original manual wheelchair. The examples of materials and accessories are such as armrest, wheels, brakes and leather seat. After analyzing the problem facing by nurse and the patient's guardians using a wheelchair, a conclusion have come out that the patient's removal tool is needed for hospitals and home care centers especially for the elderly. This tool can help the nurses and guardians of the patient to move and transfer patients easily and help reducing the pain experienced by patients by providing a best alternative for them.

Keywords: patient, wheelchair, reduce pain, transportation

Contents

CHAPTER	THINGS	PAGE
	Project title	ii
	Confirmation of Lecturer Form	iii
	Project Reports	iv
	Student Declaration Form	v
	Appreciation	vi
	Abstract	vii
	Content	viii
	List of tables	ix
	List of diagrams	x
CHAPTER 1	INTRODUCTION	
1.1	Introduction	1
1.2	Background problems	2
1.3	Issue statement	3
1.4	Objective	3
1.5	Scope of study	4
1.6	Benefit	4
1.7	Conclusion	4
CHAPTER 2	LITERATURE REVIEWS	
2.1	Introduction	5
2.2	Analysis projects, research and design	
	Standard manual wheelchair	6
	Ultra lightweight wheelchair	10
	Recline wheelchairs	13
CHAPTER 3	METODOLOGI	
	Introduction	20
	Process flow chart	21
	Design concept and study	22
	Summary of all design	26
	Comparison of each design	27
	Technical Paintings	28
	List of Materials	31

LISTS OF TABLE

TABLE	TITLE	PAGE
2.1	Comparison of wheelchairs in market	16
3.1	Summary of all design	24
3.2	Comparison of each design	25
3.3	List of materials and components used	32
3.4	List of materials and components used	33
3.5	List of materials and components used	34
4.1	Test details carried out	39
4.2	Comparison of test time 1 to test 2	40
4.3	Comparison of the number of carers or nurse	40
4.4	Material costs	43
4.5	Manufacturing costs	44
4.6	Service cost	44
4.7	Safety analysis	45

LISTS OF FIGURE

FIGURE	TITLE	PAGE
1.1	Example wheelchair manual	1
2.1	Standard manual wheelchair	7
2.2	Lightweight rigid frame wheelchair	9
2.3	Recline wheelchair	12
2.4	Barber chair	14
3.1	Wheelchair modification process flow chart	20
3.2	wheelchair	22
3.3	Idea1: supporter	22
3.4	wheelchair	22
3.5	Idea2: Jack	22
3.6	wheelchair	23
3.7	Idea3: sliding	23
3.8	The frame of wheelchair	23
3.9	New design wheelchair	23
3.10	Exploded view and bill of material	27
3.11	Isometric drawing	29
3.12	Assembly drawing and part list	31
3.13	Mild steel plate	32
3.14	Mild steel black pipe	32
3.15	Red bedpath	32
3.16	Adjustable armrest	32
3.17	Rear wheel	32
3.18	Hydraulic twist jack	33
3.19	Front roller wheel	33
3.20	Brake wheelchair	33
3.21	Footrest	33
3.22	Plate back seat	33
3.23	Handle for jack	34
3.24	Rail seat	34
3.25	Measurement and tagging process	35
3.26	Cutting process	36
3.27	Making angle for welding process	36
3.28	Finishing the angle	37
3.29	Welding process	37
3.30	Installation process	38
3.31	Finishing process	38

LISTS OF FIGURE

FIGURE	TITLE	PAGE
3.32	Flow chart of the operation PMD2.0	39
3.33	Gant chart of progress project	40
4.1	Measurement on the main part	41
4.2	Formula for centre of gravity	44
5.1(a)	PMD2.0	48
5.1(b)	Standard manual wheelchair	48
5.2	PMD 2.0	49
5.3	PMD 2.0	50
6.1	Comment from KPJ staff	53
6.2	Comment from Owner elderly care center (Kulim, Kedah)	53

Chapter 1

Introduction of wheelchair

1.1 Introduction

In this century, wheelchairs are a tool or device built to help patients with difficult mobility. The first wheelchair was built in 1595 for Phillip II of Spain by an unknown creator [1]. This wheelchair is designed with two large wheels on the left and right sides as used on bicycles and two smaller wheels. In the front Figure 1.1 shows an example of a Standard Manual Wheelchair.



Figure 1.1 shows a Standard Manual Wheelchair. [2]

In addition, the wheelchairs also come in many types and advantages according to its design for example, automatic wheelchairs, motorized wheelchairs, travel wheelchairs, sports wheelchairs and more. These wheelchairs are widely used in hospitals, elderly care homes and homes in the event of a sick family member. Wheelchairs used are the usual wheelchairs that are manually driven at the expense of not costing the user.

1.2 Background of problem

As know, the Standard Manual Wheelchairs are widely used in hospitals, home care centers and at home in the event that a sick family member needs the same energy as moving a wheelchair to move from one place to another. In addition, patients also need the help of nurses, staff and family members to help push the wheelchairs to move more efficiently .When transferring patients from bed to wheelchair or wheelchair to bed requires a more that two person to help lift the patient. There are also patients who complain during the transfer session because they feel pain and feel uncomfortable and want to do it themselves without the help of nurses or staff.

To understand the issue of transferring or moving patients from bed to wheelchair or wheelchair to bed, an interview and make a first step questionnaire in figure 1.2 was conducted at 3 places such as KPJ Perda Hospital, Ehsan Senior Care Center, Kulim and KPJ KL Tawakal Hospital. Through interviews, the problem they face is the process of moving the patient from bed to wheelchair as patients have different weights. This requires more than two people to help move the patient so that the patient does not fall down because patient safety is their priority.

Adakah anda merasa terbeban untuk mengalihkan pesakit dari katil ke kerusi roda?

13 responses

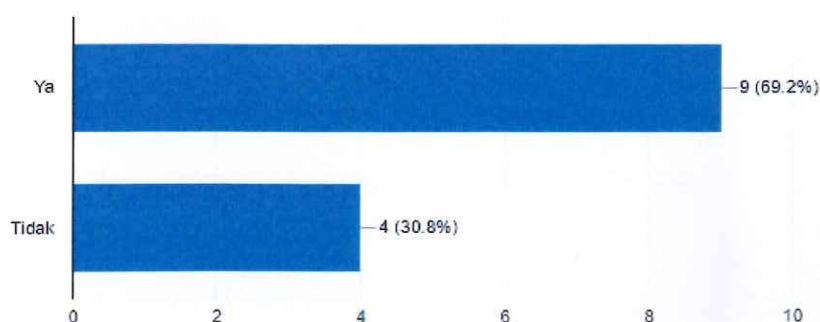


Figure 1.2 shows the problems faced by nurses and staff

In addition, based on interviews and survey, they state that only non-critical patients need to be moved from bed to wheelchair or wheelchair to bed. Critical patients do not need to move from wheelchairs to beds as they only need to be wiped and put on adult diapers while other patients need to go to the bathroom to handle their personal issues without the help of others person.

1.3 Problem statement

Based on interviews and surveys conducted at KPJ Perda Hospital, Ehsan Senior Care Center, Kulim and KPJ KL Tawakal, it was found that the three institutions had similar problems with the process of moving patients from wheelchair to wheelchair or wheelchair. The process of transferring patients requires at least 2 people per patient. When lifting patients, nurses or staff receive complaints from patients because they are feel pain during the transfer process, a method used by nurses is too strong.

1.4 Objectives

The objectives of this project:

- To design an equipment in facilitating patient transfer process from bed to wheelchair.
- To reduce pain inflicted to user during transfer process.

1.5 Scope

The scopes of this project:

- It can be used at the hospital, elderly care centre, therapy center or domestic use.
- To be used in for transferring patient (bed to wheelchair).
- To be used by weak or half lower body paralyze patient only.

1.6 Project Benefit

The project is of great benefit to institutions such as hospitals or senior care centers as it relieves the burden of nurses or staff and addresses the problems faced previously.

Reference chapter 1

No.	References (Journal/Thesis/ Website/ Blog)
[1]	https://www.greelane.com/ms/kemanusiaan/sejarah--kebudayaan/history-of-the-wheelchair-1992670/
[2]	https://www.facebook.com/sewakerusiroda/photos/a.393248614212865/393248594212867/?type=1&theater

Chapter 2

LITERATURE REVIEWS

2.1 Introduction

In the era of highly technologically advanced and fully competitive, Person's movement is no longer a foreign matter for daily activities, in the pursuit of unlimited activity for the people of nature. But how about individual who have trouble in moving from a place to another place. As a result, Wheelchairs have become more modern and sophisticated, from time to time and demanded.

Wheelchairs can be operated on their own or with the help of others. In general, when alone, the individual has to move the wheelchair with his or her hand in order to move. If there is a helper, then the helper will handle the wheelchair

There are many types of wheelchairs. The base wheelchairs have seats, levers, arm seating, seats, two (2) large wheels in the rear and (2) two small caster wheels in the front. Both rear wheels usually have handrails. Most wheelchairs have two (2) handles at the top of the back of the wheelchair to allow others to push for help when needed. Depending on the needs of the user. There are many variations of wheelchair design today.

With the design that had made, there is adjustable seating, and the height that can be increased to the level of patient bed by using a hydraulic system and sliding seat to fit the patient's posture into the wheelchair. This can move the patient with a reduction in risk movement to the patient elsewhere. It is a best used at the old folk home and in hospital. It can also reduce the energy of caretaker or patient. [1]



2.1 Standard Manual Wheelchair

Design

The manual wheelchairs have two main designs that are foldable or non-foldable. Foldable wheelchairs are usually optional as they use a little space when storing them like a car bonnet, behind doors and so on. These wheelchairs are also adjustable and removable for certain purpose. [1]

Seat

This seat is designed to allow wheelchair users to distribute pressure and weight to avoid risk. It is made of material that allows for the diffusion and absorption of pressure between the wheelchair user body and the seat surface. [1]

Material

Standard wheelchairs are made from mild steel. It is inexpensive, easy to work, readily available, and versatile. It is fairly strong, but in order to be very durable the metal itself has to be thick. [2]

Cost

A manual wheelchair cost will still be on the lower end of the price range as long as it doesn't come with any fancy features. Within manual wheelchairs, there are a few different kinds a standard wheelchair cost will be an average of \$250. [3]

Weight

so your wheelchair will weigh in between 37 and 52 lbs or 17 kg to 24 kg. on average. [2]



2.2 Lightweight rigid frame wheelchairs

The E&J Story:

Herbert A. Everest and Harry C. Jennings Sr. were friends, and both were engineers. Herbert Everest was also physically disabled after surviving a mining accident in 1918. Everest complained to Jennings about the bulk of chairs available in the early 1930s. In 1933, the pair designed and built a lightweight, collapsible model in Jennings' garage. The design was patented in October 1937. The pair soon went into business to manufacture their improved design. By the early 1970s, Everest & Jennings International was "the world's largest supplier of wheelchairs. In the 1980s they launched "Avenues," an adaptive clothing line for wheelchair users. Changes within the company and in the business landscape during the 1980s left Everest & Jennings struggling at decade's end. In 1992, facing financial difficulties from lost market share, Everest & Jennings moved from Carmarillo, California to St Louis, Missouri. In 1993, the company acquired Medical Composite Technology, a carbon fiber technology company [4].

Design

One thing to look for an ultra-lightweight wheelchair is whether the chair has a folding frame or a rigid frame. People often assume that folding frames are easier to transport than rigid frames since you just collapse the chair and stash it away in a car. But a rigid frame ultra-light wheelchair often comes apart easily for transport. After that, rigid frame styles typically have a simple design that makes it easy to store them in the vehicles. Benefit of a rigid frame over a folding frame wheelchair is that rigid frames tend to provide a smoother ride. [5]

Seat & cushions

A seat width of 18 inches tends to be the most common, although you can find models with 16-inch and 19-inch widths as well. When it comes to seat height, wheelchairs often come in three sizes: standard and tall. A seat height is usually about 17.5 inches off the ground. It's the most appropriate height for people under 5 feet, 5 inches tall. A standard seat height is usually 20.5 inches off the ground and is ideal for people between 5 feet, 5 inches tall and 6 feet, 2 inches tall. People over 6 feet, 2 inches often benefit from a tall seat, which is usually 21.5 inches off the ground. To ensure the right height, have your loved one sit in the chair. His or her feet should just touch the ground, but shouldn't drag on floor. If the feet hanging in the air, the chair is too tall, and it will be difficult to get into and out of it [5]

Materials

Both lightweight and ultra-lightweight wheelchairs can feature aluminium frames. Aluminium is considered as the lightest metal compared to steel. Some ultra-lightweight wheelchairs feature titanium frames. [5]

Cost

Ultra-Light Weight wheelchairs are easy to fold and store in small places. They are made of a combination of steel and aluminium which allows the wheelchair to weigh below 29 pounds. It has ergonomic seating for comfort and stability. Ultra-Light Weight wheelchairs come in a variety of designs and colors. The average cost of an ultra-lightweight wheelchair is \$700 - \$1,995 .

Weight of wheelchairs

Lightweight and ultra-lightweight wheelchairs are the perfect solutions for the person that's need. The wheelchair's weight and size makes them easier to manipulate. The difference between a lightweight and an ultra-lightweight wheelchair comes down to weight. Although a "lightweight" chair does weight less than a conventional chair, many people would consider this type of chair to be too heavy. Some lightweight models weigh 30 to 40 pounds or 12-17 kg, and that's before you attach the rigging or leg rests. ultra-lightweight wheelchairs typically weigh under 25 pounds or 11 kg. Some define an ultra-lightweight wheelchair as being under 19 lbs. It's also possible that weigh less than 15 pounds. [5]



2.3 Recline Wheelchairs

Introduction

Recliner wheelchairs are not popular and while some users can benefit from a reclining wheelchair they are rare. They are heavy wheelchairs, not very transportable difficult to propel for the user. [6] The biggest problem with reclining wheelchairs is that when the back is moved from upright to a recline position physics and gravity try to push the users bottom forward on the seat, which causes a shearing action that can, at best be uncomfortable and at worse cause skin breakdown and pressure sores.

In spite of the issues surrounding reclining wheelchairs there are cases when they are necessary and appropriate. The first is when the hips of the user cannot be placed in a 90° position and the user is naturally reclined and another is when one or both knees cannot be bent.

Design

Reclining wheelchairs are generally designed for institutional use and are of fairly heavy construction. The frames will normally be made of steel and have a weight of between 45 lbs. and 55lbs. They do usually fold from side to side but their weight and overall size makes them difficult to lift and transport. [6] The rear wheels on this category of wheelchair are normally available in 20", 22", or 24" with the larger sizes being most common and have either air filled or solid tires but solid are most common.

Seat and Seat cushions

This seat is designed to allow wheelchair users to distribute pressure and weight to avoid risk. It is made of material that allows for the diffusion and absorption of pressure between the wheelchair user body and the seat surface. [1]

Materials

It was manufactured by high alloy Folding 6061 T-6 Aircraft-grade aluminium. [9] But there verity of material in market such as mild steel, chrome and much more to develop into the light weight for user convenient.

Cost

Reclined wheelchair with combination of parts and materials, the cost it will remain between price of \$950.00 in the market .it seem to expensive , but usually store provided payment as low as \$30.65 per month*.[9]

Weight

The product was made between 36lbs-38lbs, with a convenient weight capacity for a normal user to lift. The weight can be accommodated capacity is with the patient weight between 250lbs-350lbs.over than that it may cause a undesirable accident.[9]



2.4 Barber chair concepts

Design

This chair a reclinable back can make user feel comfortable while being easily positioned. It also has an adjustable headrest, removable bar for neck strips and heavy duty hydraulic pump. has a classic antique look, upgraded with high quality upholstery and hand polished stainless steel edges. W: 31" Arm to Arm: 21" Depth of Seat: 19" H: 47.5" Seat to Ground: 25" ~ 31" Diameter of Base: 26.8".

Seat &cushion

The barber seat height generally adjusted by hydraulic pump, Usually the hairdresser put half foot on the pedal can adjust the height of hair cutting chair, by hand to handle the pneumatic valve to adjust the backrest angle.[7] Barber chairs usually with up & down lifting function and rotation function, these designs provide great convenience.

Materials

This new modern hair styling chair has comfort high density of memory foam, covered with high quality PVC material. Heavy duty hydraulic pump make height adjustment easier, from 0-4.7". Back seat can be reclined up to 135 degree. Heavy duty components, a premium chrome base make the barber chair both reliable and functional. It is also came with high alloy and strong base frame structure.

Cost

the usually of this product will have a lot of prices base on the design and function , for this it may cost \$385.99. this is a highly price but it may have a nice look and design.

Weight

the load of this chair can be accommodate was 200kgs(max.800lbs).

No.	Product example model	References (Journal/Thesis/ Website/ Blog)	Features of Wheelchairs	Main Material/ Wheelchairs Frame.	Cost (RM)	Weight (Kg)
1.	Standard Manual Wheelchair	[1] Jasni bin Abdullah. (27 February 2017) "My Healthy: Tips Pengendalian Kerusi Roda". Retrieved from http://www.myhealth.gov.my/tip-pengendalian-kerusi-roda/. (Accessed 8 March 2020). [2] Spin Life Expert in Motion, (1999-2020)." Manual wheelchair Materials" Retrieved from https://www.spinlife.com/. (Accessed 8 March 2020) [3] Help Wellness. (July 1,2018) HW help and Wellness. Retrieved from https://www.helpandwellness.com/how-much-is-a-wheelchair/. (Accessed 8 March 2020).	Design, Seat and Seat cushions	Steel Frames	250	17-24

2.	Ultra lightweight wheelchair	[4] British Health Trades Association (27 February 2017). “Everest and Jennings wheelchairs Corby (1977)”. Retrieved from http://bhta.com/everest-and-jennings-wheelchairs-corby-1977/ (8 March 2020). [5] MovementAdvisor.com is based in Irvine, California, United States of America. Retrieved (8 march 2020). https://www.movementadvisor.com/ultra-lightweight-wheelchair/. [6] Smart Chair 200314 NE 16 Place Miami, FL 33179, (2019). “Cost of Wheelchair”. Retrieved from https://kdsmartchair.com/pages/average-cost-of-wheelchairs. (Accessed 8 March 2020).	Seat widths and depths Casters, wheels and tires Rigid body frames	Titanium/ Aluminum/	700	6-17
3.	Recline wheelchairs	[7] David steward (2002-2019) Mobility Basics.ca “Home Medical Equipment Information and resources”. Retrieved from https://mobilitybasics.ca/wheelchairs/recline. (Accessed 11 March 2020).	Casters, Wheels and Tires Axle plates Armrests Foots rest	Alloy steel	945	20-25

		[9] KARMA MEDICAL PRODUCT (UK) https://www.1800wheelchair.com/product/karman-ultralight-reclining-wheelchair/ (Accessed 17 April 2020).				
4	Barber chairs	[8] https://www.salonfurniturecheap.com/new/The-characteristics-of-Barber-chair-structure.html	Seat Widths and Depths Armrests Footrests	Stainless steel	600	25-40
5		[9] https://youtu.be/0SUN5B2-iDo	Slideboard wheelchair (video)			
6		[10] https://youtu.be/TZ6xeS_GjSk				

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter focus on the process of upgrading the existing wheelchairs at hospitals and elderly homes. Overall, the manufacturing process is shown in Figure 3.1. First, a series of questionnaires were conducted at hospitals and elderly homes to analyse problem that people facing when using wheelchair, especially when moving patients and other existing shortcomings that came with the wheelchairs. A list of design problems then were created to come up with a tool that can help overcome the problems. After that, the parts that need to modify were identify and selected components are going to be used to replace them. Next, a selection of design ideas were created and evaluate and finally the most appropriate design is selected for the final presentation. Therefore the estimate of the cost required for this wheelchair can be estimated and use as desired. Finally, improvements will be made in case of any deficiencies that can occur after the testing of the project.

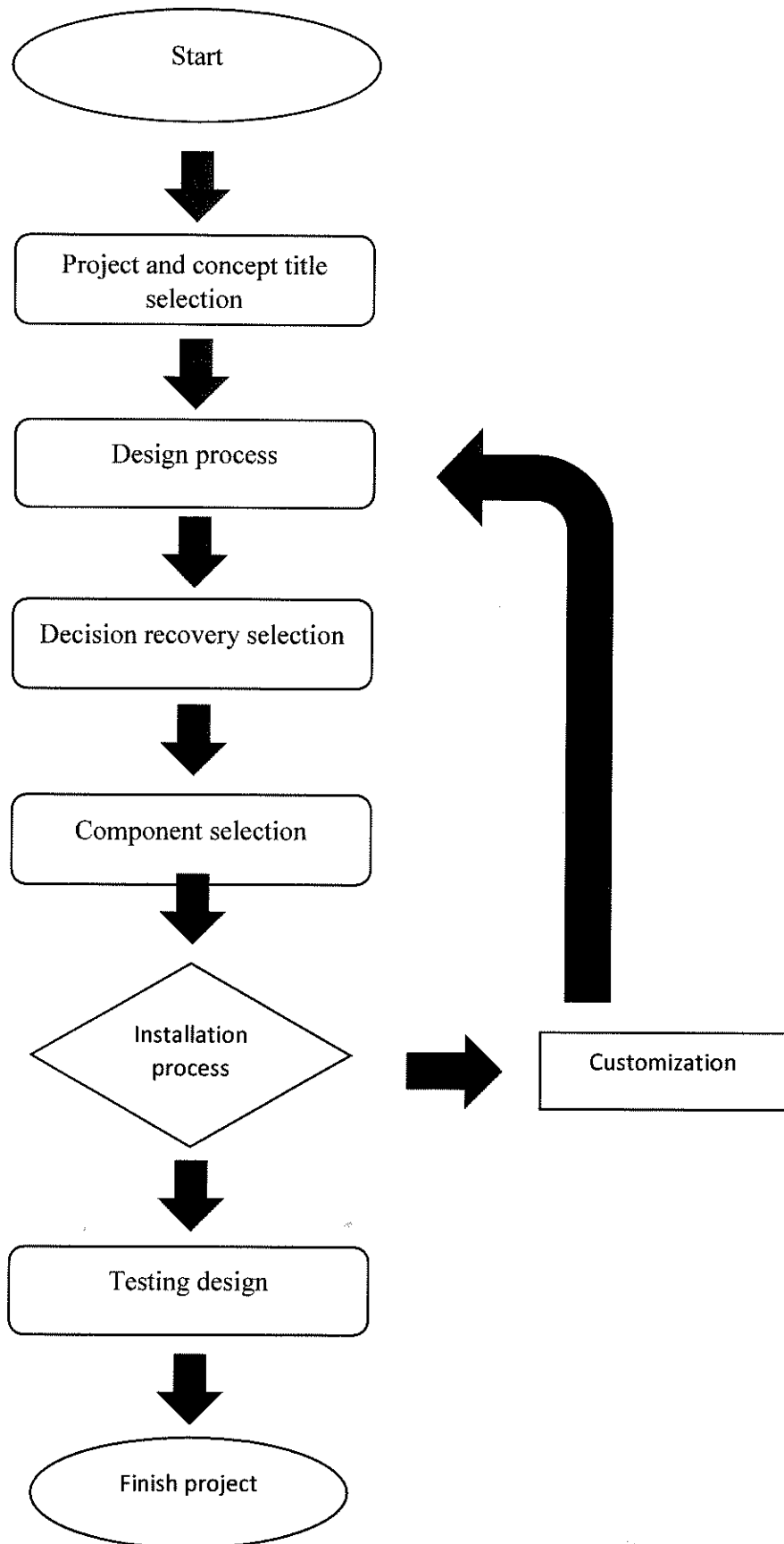


Figure 3. 1. Wheelchair Modification Process Flow Chart