POLITEKNIK MALAYSIA

SULTAN SALAHUDDIN ABDUL AZIZ SHAH

LEG ACTUATED WATER TAP SYSTEM

MECHANICAL ENGINEERING DEPARTMENT

SESI 2: 2022/2023

JEEVAN A/L ATHIGESAN (08DKM19F2030)

THANES A/L ATHIGESAN (08DKM19F2031)

ABEDNEGO A/L ANTHONY NATHAN (08DKM19F2013)

ACKNOWLEDGEMENT

we would like to express our sincere gratitude to several individuals and organizations for supporting us throughout my final year project completed. First and foremost, we wish to express our sincere thanks to our supervisor, En. Somchai A/L Enoi, for his patience, enthusiasm, insightful comments, invaluable suggestions, helpful information, practical advice, and unceasing ideas which have helped us tremendously at all times in our final year project report. His immense knowledge, profound experience, and professional expertise in mechanical engineering have enabled us to complete this final year project successfully. we are thankful to him for his precious time in guiding us, answering our queries, and correcting us if we did any wrong. Without his guidance and relentless help, this final year project would not have been possible. we could not have imagined having a better supervisor in our study.

ABSTRACT

From the day our research started, we found that the handicapped who have no hands or other body parts faced difficulty in operating the ordinary water tap system by themselves. However, the infection of bacteria from contact with the water tap also became their second major problem. So, the main objective of this research is to design a leg-actuated water tap for handicapped toilets and help the handicapped use the leg-actuated water taps by themselves in a safe way. The concept idea of the project was designed for both handicapped wheelchair users and handicapped users who do not use wheelchairs with other disabilities. The concept of this mechanism is, that when the wheel goes on the wheelchair pathway, the pressure from the wheel activates the push valve. Then the water flows into the water tap as there is a delay time configured in the push valve. The leg-actuated water tap is built by using stainless steel plates, a push valve, pipe connectors, a water tap, and a foot pedal. After completing the project, testing has been carried out on the residents of the Taman Tennamaram with a questionnaire survey. This research includes a review of the literature, data from surveys, site visits to the location study, and data analysis to writing this research report. From the analysis questionnaire, we can analyse that the leg-actuated water tap is easier to use by the handicapped and normal people. As the result, the information gathered from the methods above helps to build the leg actuated water tab. Hence, the purpose of this mechanism is to help the handicapped to wash their hand without any contact with their body through the water tab system is achieved. The mechanism of our project is easy to use for the handicaps, low pressure is needed to activate the water system and people can perform individually to operate this leg-actuated water tab. The suggestion for future upgrades is to give attention to the blind people to operate the water system by adding a few mechanisms which help them to operate the leg-actuated water tab. Finally, this project is beneficial to handicapped users. With this project, the handicapped users can survive in their private space, which is inside the toilet without anybody’s help, and they have independency.

ABSTRAK

Sejak hari penyelidikan kami bermula, kami mendapati bahawa OKU yang tidak mempunyai tangan atau bahagian badan yang lain menghadapi kesukaran untuk mengendalikan sistem paip air biasa dengan sendiri. justeru, jangkitan bakteria akibat sentuhan dengan pili air juga menjadi masalah utama kedua mereka. Oleh itu, objektif utama penyelidikan ini adalah untuk mereka bentuk paip air yang digerakkan menggunakan kaki untuk tandas orang kurang upaya dan membantu orang kurang upaya menggunakan paip air yang digerakkan mengunakan kaki dengan sendirinya dengan cara yang selamat. Idea konsep projek itu direka untuk kedua-dua pengguna kerusi roda kurang upaya dan pengguna kurang upaya yang tidak menggunakan kerusi roda dengan kecacatan lain. Konsep mekanisme ini ialah, apabila roda berjalan di laluan kerusi roda, tekanan daripada roda mengaktifkan injap tolak. Kemudian air mengalir ke dalam pili air kerana terdapat masa tunda yang dikonfigurasikan dalam injap tolak. Paip air yang digerakkan oleh kaki dibina dengan menggunakan plat keluli tahan karat, injap tolak, penyambung paip, pili air dan pedal kaki. Selepas menyiapkan projek, ujian telah dijalankan ke atas penduduk Taman Tennamaram dengan tinjauan soal selidik. Penyelidikan ini merangkumi tinjauan literatur, data daripada tinjauan, lawatan tapak ke kajian lokasi, dan analisis data untuk menulis laporan penyelidikan ini. Daripada soal selidik analisis, kita boleh menganalisis bahawa paip air yang digerakkan dengan kaki lebih mudah digunakan oleh orang kurang upaya dan orang bukan berkurang upaya. Hasilnya, maklumat yang dikumpul daripada kaedah di atas membantu membina tab air yang digerakkan menggunakan kaki. Oleh itu, tujuan mekanisme ini adalah untuk membantu orang kurang upaya untuk mencuci tangan mereka tanpa sebarang sentuhan dengan badan mereka melalui sistem tab air dapat dicapaikan. Mekanisme projek kami mudah digunakan untuk orang cacat, tekanan rendah diperlukan untuk mengaktifkan sistem air dan orang ramai boleh melakukan secara individu untuk mengendalikan tab air yang digerakkan oleh kaki ini. Cadangan untuk naik taraf pada masa hadapan adalah untuk memberi perhatian kepada orang buta untuk mengendalikan sistem air dengan menambah beberapa mekanisme yang membantu mereka mengendalikan tab air yang digerakkan oleh kaki. Akhir sekali, projek ini bermanfaat kepada pengguna kurang upaya. Dengan projek ini, pengguna kurang upaya boleh bertahan di ruang peribadi mereka, iaitu di dalam tandas tanpa bantuan sesiapa, dan mereka mempunyai kebebasan. Mekanisme projek kami mudah digunakan untuk orang cacat, tekanan rendah diperlukan untuk mengaktifkan sistem air dan orang ramai boleh melakukan secara individu untuk mengendalikan tab air yang digerakkan oleh kaki ini. Cadangan untuk naik taraf pada masa hadapan adalah untuk memberi perhatian kepada orang buta untuk mengendalikan sistem air dengan menambah beberapa mekanisme yang membantu mereka mengendalikan tab air yang digerakkan oleh kaki. Akhir sekali, projek ini bermanfaat kepada pengguna kurang upaya. Dengan projek ini, pengguna kurang upaya boleh bertahan di ruang peribadi mereka, iaitu di dalam tandas tanpa bantuan sesiapa, dan mereka mempunyai kebebasan.

TABLE OF CONTENTS

LIST OF FIGURES

ABBREVIATION LIST

RM	Ringgit Malaysia
PVC	Polyvinyl Chloride
etc	Et cetera (extra)
kg/cm	Kilogram/centimetre
kg	kilogram

ATTACHMENT LIST

CHAPTER 1
INTRODUCTION

1.1 Introduction

Our project is Leg Actuated Water Tap. The introduction to the project is how we got the idea for this project and it is based on handicapped toilet users. As we can see at public/government handicap toilets we usually witness normal ordinary water systems in which we use our hands to open and close the water system. We as a group find out that those who are handicapped find it difficult to use the ordinary water system at the toilet. Our project is based on simple materials and is also very efficient and helpful to the users who find trouble using the normal water system. The idea of this project is a water system where we can use our feet too on and off the water system which is a leg-actuated water tap. When the user opens the tap to wash his dirty hands, he must first wash the faucet handle and then wash his hands again. Furthermore, as fingertips slide across tap knobs, some handle types may be difficult to open and close. When cleaning numerous pots or utensils in the kitchen in a row, the user cannot make use of the water running during the times he shifts between them, and most users do not or cannot shut off the water, which continues to flow to the sink without being used.

1.2 Background of the project

The handicapped toilet is for the handicapped individuals who need to use the toilet. It is because handicapped individuals cannot use the normal ordinary toilet. A handicapped toilet is built for handicapped individuals to make their process of using the toilet easier. A handicap toilet is usually fitted with metal railings and holders for the person who uses a wheelchair or has any difficulty moving around. This is the reason why handicapped individuals are given a separate toilet or bathroom from the normal ones. The normal toilet has a normal water system and tap where you need to use your hands to operate the water tap. Where else, our leg-actuated water taps with the same measurements as a normal water tap system and used materials such as PVC, metal, and stainless steel to construct the leg-actuated water tap.

The components in our project. The pedal is the main part of this project. A rubber padding will be on top of the pedal. So that the user will not get their leg slipped while their

foot is wet because usually, the environment in the toilet is wet. The diameter of the pedal will be 30cm because if the surface of the pedal is wide enough for the user to step on the easier it will be for them to use. When the foot pedal is depressed, the mechanism connected to it causes the valve core to open against spring resistance. When you press the pedal, this function speeds up the valve opening and closing. The pedals are connected to the valve levers by flexible wires, allowing them to be folded up to make cleaning the ground beneath the basin easier. By sliding the valve lever to its most open position, the pedal function can be turned off. The flow rate is controlled by the leg-operated water tap, while the pedals are used for on/off control and still have some flow rate manoeuvres. To avoid corrosion, all of the pieces utilized in this project are made of water-resistant materials. The torque required to open the valve is in the range of 30 kg/cm and the suitable force to be exerted down by foot pressure is 3 kg on any side of the pedal. When the force is applied the water will be flowing from the tap as usual.

An automated water taps system costs around RM 600 to Rm 800 at the market price. Even though, a non-automated water tap system also costs around Rm 200 to Rm 400. These prices are not even included with installation fees and prices. Nowadays we can know that the installation of an automated or non-automated water tap system is quite high. Our project estimated price value is around Rm 100 to Rm 150 at a very reasonable price. The project is also going to be done with good-quality items.

1.3 Problem statement

1.3.1 Handicap users without body parts such as hands, etc.

Handicapped who have no hands or other parts face difficulty in operating the ordinary water tap system. Those handicapped without hands will find this project very helpful for them as they do not need to struggle to use the water tap at the toilet. Handicaps who are struggling with using a normal water system may be on the tap but could not close it. So, our project where you just need to press the pedal will make the process of using the water tap easier and in a more efficient way.

1.3.2 Infection of bacteria from contact with the water tap

As we can see the world is battling many types of bacteria, viruses, and diseases that are deadly to humans. For example, the coronavirus which is known as Covid-19 has been spreading rapidly around the world with just contact with anything either human or things. Our project which is a leg-actuated water tap that is powered by our legs makes us and everyone protect against these deadly bacteria, viruses, and diseases. As we can this project is efficient in taking care of the hygiene of the users.

1.4 Objective

1.4.1 To design a leg-actuated water tap for a handicapped toilet

.

1.4.2 To fabricate a leg-actuated water tap for a handicapped toilet

1.4.3 To evaluate the efficiency and reliability of the project for the handicap toilet

.

1.5 Significance of study / Research

The significance of the study for our project is based on our mechanical engineering knowledge which we have learned throughout. We have implemented the knowledge in creating a new water tap system which is leg actuated water tap that will benefit the handicapped individuals who use the toilet. As a mechanical engineering student with the knowledge of how fluid mechanic works and fabrication skill, we have come up with the idea of making this new type of water tap system. This leg-actuated water tap can also be used for various reasons and places which can be beneficial to any user for using this leg-actuated water tap.

1.6 Expected result

The expected result is a usable leg-actuated water tap system that can be used by the handicapped individuals and get to be beneficial to them when they use the handicapped toilets. The main goal and reason of this project are to benefit those who find difficulties using the toilet. So, when the leg-actuated water tap system is being implemented and becomes user-friendly it is the result expected.

In the end, the result will be a full leg actuated water ta system with steel welding connected with the tap which will on and off the water. The valve will also be controlled and the pedal compression of the spring underneath will all be set accordingly and at the final, we get a fully usable leg-actuated water tap system.

1.7 Summary

The summary for this whole process and our project is the main thing which is to construct a troubleshoot for the problem faced by the toilet user. For the problem we have found out which is handicapped individuals who face difficulties using the ordinary toilet. We are creating and had come up with the idea of making leg actuated water tap system which will be beneficial and also solve the problem which is faced by the handicapped individual who uses the toilet. In the end, we get to create a new type of water tap system.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

This chapter presents analyses and reviews from prior projects, publications, and sources that aid in the effective design, construction, and implementation of the leg-actuated water tap project. The studies involve enhancements and modifications to the preceding project's design. The hardware section will cover all mechanically associated.

2.2 Leg-actuated water taps

There are already some leg-actuated water valve systems available. They are costly, and the water piping systems must be replaced and reinstalled. According to researcher experience, there are no practical applications for accessing the tap by foot or wheelchair. Foot-operated taps reduce water waste while also assisting in the prevention of infectious diseases. There are numerous registered applications in the field of leg-actuated water tap valves, but each of these inventions has one or more practical issues, as follows:

1. The design is only suitable for new structures and cannot be applied to current systems without modifying the tap and the connections, which are frequently located inside the walls.
2. The pedal should be attached close to the bottom to prevent the basin's bottom area from being cleaned. This particular location requires cleaning and drying because it is continually exposed to water falling during usage.
3. Certain valves are only compatible with specific tap types.
4. Some designs necessitate altering the basin or pillar.
5. The implementation costs are considerable due to the general necessity for specialized manufacturing.

This effort tries to mitigate previous shortages through an innovative design. As a result, using a push valve that stops the water valve and then uses an external mechanism to press the valve open is recommended for opening taps with your feet. Weaning when using a wheelchair is the same as weaning while using a foot-operated wheelchair. This strategy reduces the risk

of infection caused by several hands encountering the tap handle in public restrooms, in addition to decreasing water waste by only opening taps when they are needed and closing them fast. This method is a cheaper alternative to using electricity.

2.3 Reviewed design

The design shown below is an assembly of a spring-loaded valve to which a foot actuating device that is designed should attach to the water tap.

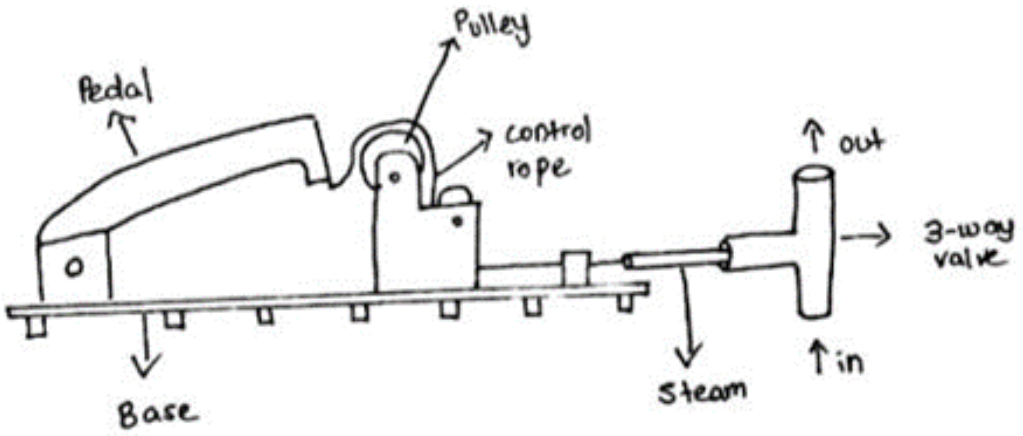


Figure 2.3.1: Method/procedure/technic of project development

The 3-way valve which houses the closure element and a compression spring has been used to help in mounting the valve into the wall in which the pipelines pass and also bear the load exerted on the valve. This valve was selected to allow easy fluid flow through the valve, avoid changes in inlet and outlet pressure, and to also facilitate easy manufacture and assembly. This 3-way valve which houses the closure element and a compression spring was attached to the control rope by using a stem as a mediator. When the pedal was pressed, the attached control rope was partially pulled out from the valve with the help of a pulley. This action works as an ON and OFF button in the valve to allow the water to flow smoothly to the water tap. The cover covers the pulley assembly to protect it from dust and spillage of fluid.

2.4 Summary of the invention

This invention includes a foot-operated faucet for wash basins that allows the user to wash without having to use his hands to operate the device. According to the present invention, a foot pedal can be pressed to control the operation of a push-button valve via a wire cable that operates a lever to actuate the push-button valve. The foot pedal contains a latching mechanism that keeps it pressed to keep the valve open and fluid flowing. The latch is opened by a separate release pedal, which allows the foot pedal to return and the valve to close, stopping the flow of water. As a result, one goal of the present invention is to develop a fluid controlling mechanism that can be triggered by tapping a foot pedal and remains active until it is released.

CHAPTER 3
METHODOLOGY

3.1 Introduction

This chapter describes understanding the objective and planning the design by performing some management methods to keep this project stand on the right track. To ensure leg actuated water tap prototype successfully developed, some tasks have must be performed following a sequence of work were divided into three stages are technic of project development, proposed material, tools, equipment, and method of data analysis.

3.2 Methodology flow chart

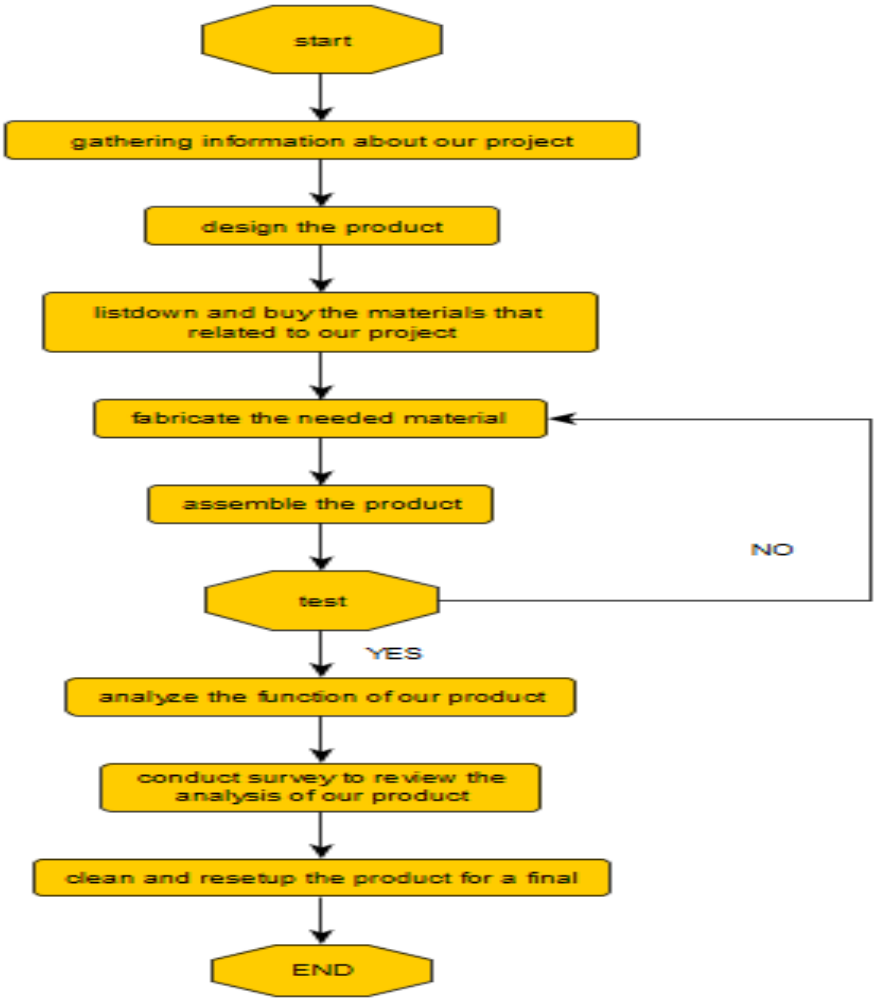


Figure 3.2.1: Methodology flow chart

3.2.1 Identifying problems

At the beginning of this study was done to identify the problem of disabled people who couldn't stand up to wash their hands. Therefore, careful planning is implemented to overcome the problem by making leg-actuated water taps for disabled people. This is because most people with disabilities who use wheelchairs cannot stand and wash their hands.

3.2.2 Analysis

The data obtained are collected, processed, and analysed to enable the next step to be taken and the determination of the study to be done as required in the objectives.

3.2.3 Design

Before the leg-actuated water tap is implemented, the design has been designed to find out the stable characteristics to accommodate the wheelchair of human load in it. This design is intended so that before the implementation is done, it can be illustrated before the project is implemented even this design will provide more detailed information to build a platform that has a footpad on the leg actuated water tap to operate more easily for people with disabilities.

3.2.4 Implementation

When a leg-actuated water tap has been completed, the leg-actuated system should be tested by connecting water to find out the results whether it is stable and strong or otherwise it does not withstand the weight of a wheelchair occupied by a disabled person.

3.2.5 System

When the leg actuated water tap has been completed by the desired objective given, the product is placed in a common area to observe the usage of our production efficiency and disable users' problem can be overcome to use the water tap.

3.3 Data collection methods

To carry out this study, there are data collection methods have been practised to obtain data that are important for the analysis stage. Among the data collection methods is the questionnaire method. Data collection can be classified into two types, that are primary data and secondary data.

3.3.1 Primary data

Primary data collection is the process of gathering data through surveys, interviews, or experiments. In this form of data collection, researchers can personally ensure that primary data meets the standards of quality, availability, statistical power, and sampling required for a particular research question. With globally increasing access to specialized survey tools, survey firms, and field manuals, primary data has become the dominant source for empirical inquiry in development economics

3.3.2 Secondary data.

Secondary data is the data that has already been collected through primary sources and made readily available for researchers to use for their research. It is a type of data that has already been collected in the past. Sources of secondary data include books, personal sources, journals, newspapers, websites, government records, etc. Secondary data are known to be readily available compared to that primary data.

3.4 Research instruments

In this study, the questionnaire method was chosen. The selected respondents are members of one of our project member's neighbourhoods. The questionnaire used consists of a 5 scale Likert type format (1 = strongly disagree to 5 = strongly agree). The questionnaire that will be prepared is divided into three (3) main parts; it is: -

I. Section A: Respondent Demographics
II. Section B: responds to the problem faced by the disabled people
III. Section C: Questions related to our product.

3.5 Product manufacturing

3.5.1 Outfit project

Figure 3.5.1.1: base

Figure 3.5.1.2: base

Figure 3.5.1.3: sink

Figure 3.5.1.4: sink holder welding part

Figure 3.5.1.5: aluminium plate welding

Figure 3.5.1.6: outfit project

The aluminium plates are measured and cut into different sizes to build this outfit of the product is a leg-actuated water tap. The base part was constructed using the welding method, as shown in Figures 3.5.1.1 and 3.5.1.2. The dimension of the base part is 50cm x 46cm x 14cm. Following that, the sink holder was built in the same method as the base part. According to figure 3.5.1.3, the middle part of the sink holder was perforated using an iron grinder machine. Figure 3.5.1.5 shows an aluminium plate that has been welded on the base part. Accordingly, figure 3.5.1.6 shows the use of the Length aluminium which is to join the base and sink holder. The height of the aluminium plate is 80cm.

3.5.2 Leg actuated mechanism

Figure 3.5.2.1: pipe connector

Figure 3.5.2.2: push valve

Figure3.5.2.3: PVC connector

Figure 3.5.2.4: inlet and outlet pipe

Figure 3.5.2.5: leg actuated mechanism

Figure 3.5.2.2 is the push valve used in this mechanism. Figure 3.5.2.1 is an “L” angle connector and Figure 3.5.2.3 is a PVC connector. Figure 3.5.2.4 is the inlet and outlet pipes. These four items are used to build the leg actuated mechanism as shown in figure 3.5.2.5. firstly, the pipe connectors are attached to the push valve. Accordingly, the inlet pipe and outlet pipe are installed using white sealing tape.

3.5.3 Foot and wheelchair combined pedal mechanism

Figure 3.5.3.1: foot pedal

Figure 3.5.3.2: aluminium block

Figure 3.5.3.3: pedals connector

Figure 3.5.3.4: wheelchair pedal (pathway)

Figure 3.5.3.5: valve holder

Figure 3.5.3.6: foot and wheelchair combined pedal mechanism

8cm x 20cm x 1.5cm dimensioned foot pedal and 30cm x 5.5cm x 3cm dimensioned wheelchair pedal is shown in figures 3.5.3.1 and 3.5.3.4, respectively. Figure 3.5.3.3 shows that iron was modified to connect the two pedals. Figure 3.5.3.2 represents an important aluminium block in this mechanism. Because the aluminium block holds both a base and a valve holder (figure 3.5.3.5), in this mechanism. When this fusion is complete, the outcome is the foot and wheelchair combination pedal system, as shown in figure 3.5.3.6.

3.5.4 Final attachment

Figure 3.5.4.1 final product

In the project outfit mentioned above, leg actuated mechanism and foot and wheelchair combined pedal mechanism were installed on the base. Next, a sink and water tap are also attached to the top of the outfit. Finally, the leg-actuated water tap of our product has been completed as shown in figure 3.5.4.1.

3.6 Summary

There is a significant need to improve the ordinary water tap system which we need to use our hands to operate the water tap system. This design is made to make the process of using the water tap system for handicapped individuals has been made easier with the steps and research elaborated above. Recognizing this problem which is the normal water type system we have come up with the leg actuated water system which will serve the same role as an ordinary water tap system. The project and product of this research are used with the necessary tools for safety performance and requirements. The objective of this research is to develop the methodology that makes the process of using the water tap system for handicapped individuals. To summarize, the evaluation of the prices of the tools and to complete the project has been done.

CHAPTER 4

RESULTS OF DATA ANALYSIS AND DISCUSSION

4.1 Introduction

Once all the data and information were obtained, analysis was performed for seeing the effectiveness of the leg-actuated water tap among the people in Taman Tennamaran as a research area.

The results obtained in this chapter are results obtained from questionnaires and surveys that have been conducted in the research area. Data from the study area survey were analyzed in more detail to draw conclusions based on the study's objectives.

The study was conducted using 55 respondents from Taman Tennamaram. The survey that we conduct is based on the information below: -

1) Respondent Demographics (gender and age)

2) Respondents' perspective on leg actuated water tap: -

I. dimension
II. pedal position
III. product efficiency
IV. design

3) respondent's opinion (feedback)

4.2 Respondent Demographics

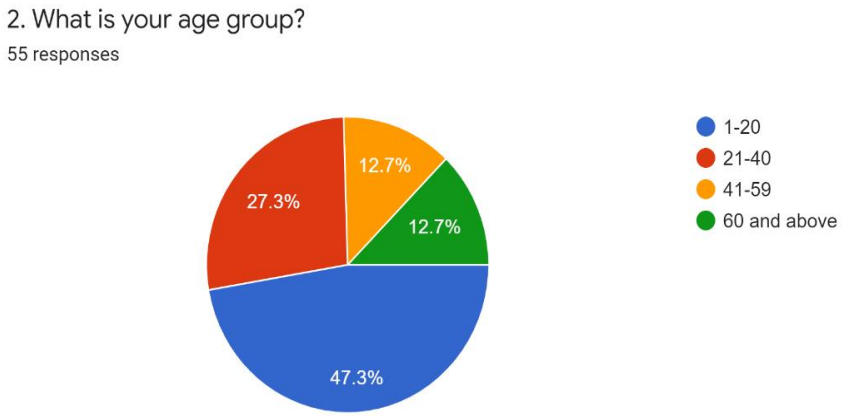
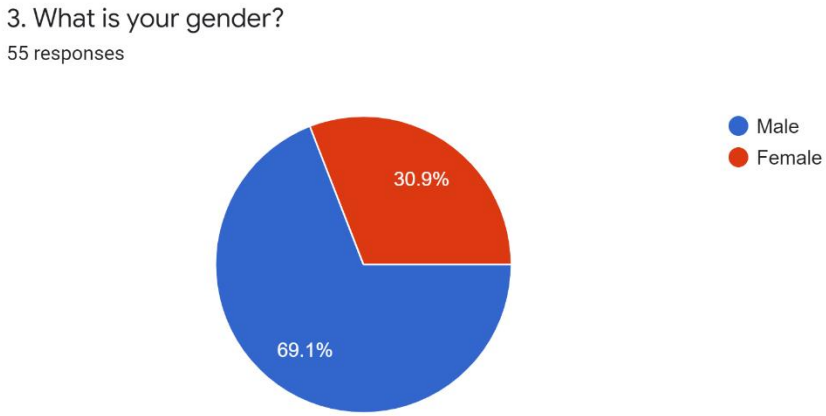


Figure 4.2.1: Age group

From the pie chart, it is clear that the major respondents are around the age group of 1-20 mentioned at 47.3%. The second major respondents are around the age group of 21-40 which equals 27.3%. in the third place is the aged group of 41-59 and 60 above were recorded with 27.7% for each respectively. it shows the younger generation is the pillar of our future nation. so, a lot of youngsters participate in this survey and we get their opinion on our project.



4.2.2: Gender

This pie chart shows that out of 55 people that completed this survey, 69.1% of these were male and 30.9% were female. Even though the respondents are not equal amount, it did not affect my overall result drastically.

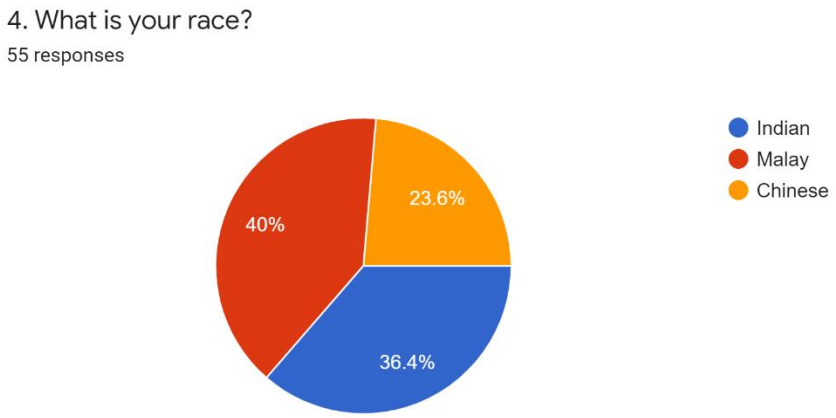
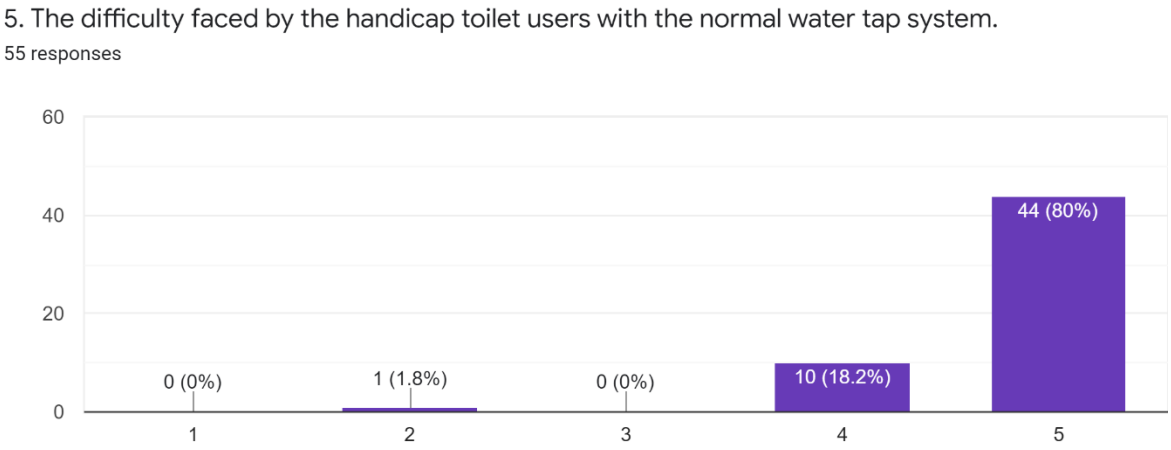


Figure 4.2.3: Race

In this pie chart, there is 40% of the total respondents are Malay people. 36.4% were Indians and 23.6% were Chinese. This survey was conducted at Taman Tennamaram and its surrounding area, the respondents are chosen randomly.

4.3 General view of the study



4.3.1: Difficulty faced by the handicapped toilet users with the normal water tap system

From this bar chart, we can understand that 44 people 80% of the overall respondents strongly agreed with the statement of difficulty faced by the handicapped toilet users with the normal water tap system. 18.2% equal to 10 people just agreed with this statement. However, there is 1 person which equals 1.8% have disagreed with this statement. 54 out of 55 respondents are agreed with this statement proves that handicaps are facing difficulty with the normal water system.

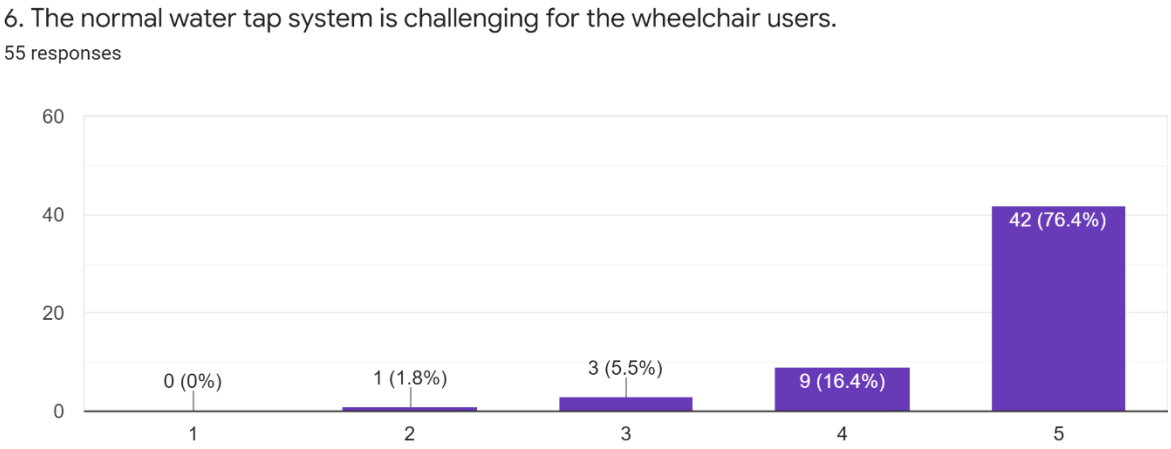


Figure 4.3.2: The normal water tap system is challenging for wheelchair users.

In this bar chart, we can analysis those 51 respondents supported our statement by selecting the option strongly agreed and agreed. The percentage of the respondents selecting the option strongly agreed and agreed is 76.4% which results in 42 respondents and 16.4% which results in 9 respondents respectively. Here is also 1 respondent who was selecting the

option and disagreed with the statement. In between that, 3 respondents are selecting the option in middle.

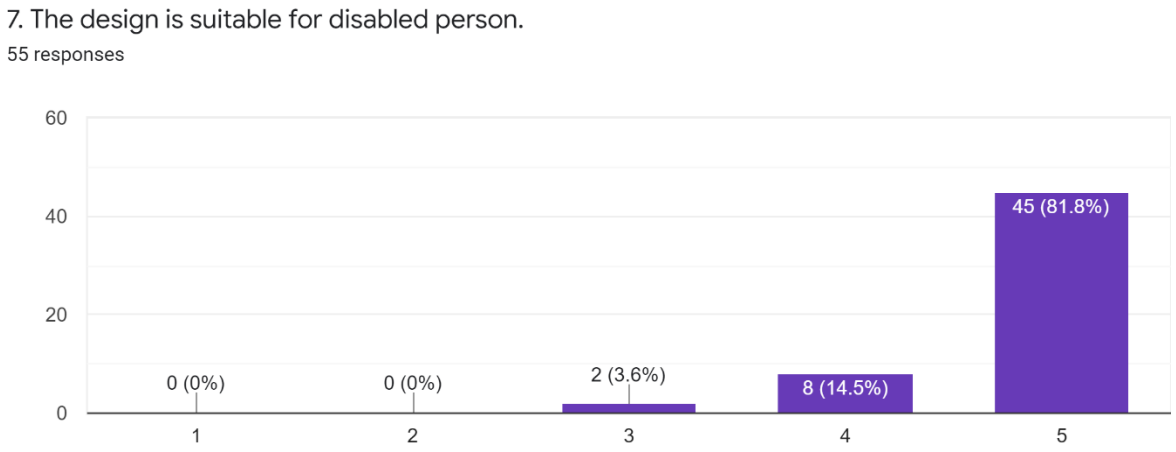


Figure 4.3.3: the design is suitable for the disabled person

This bar chart shows that almost all respondents agreed with the design that we made for disabled persons. 2 respondents mentioned that our design is good. Meanwhile, 8 respondents which is equal to 14.5% agreed with the statement above. Most of the respondents strongly agreed with our design and the respondent quantity is 45 out of 55 which is 81.8%.

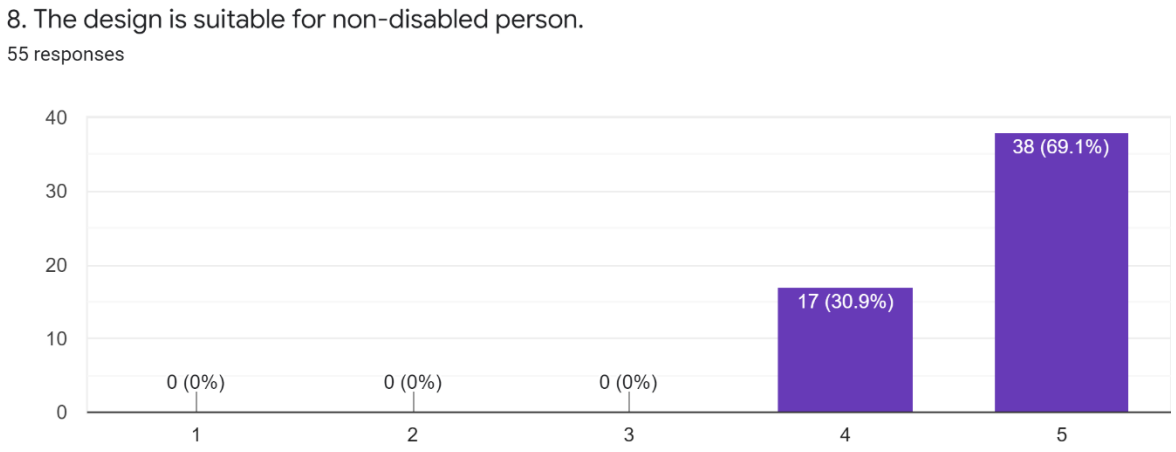


Figure 4.3.4: The design is suitable for a non-disabled person.

In this bar chart, all the respondents agreed and strongly agreed that our design is suitable for non-disabled persons. 17 respondents agreed and 38 respondents strongly agreed with this statement. The percentage that has been recorded is 30.9% for those who agreed and 69.1% for those who strongly agreed.

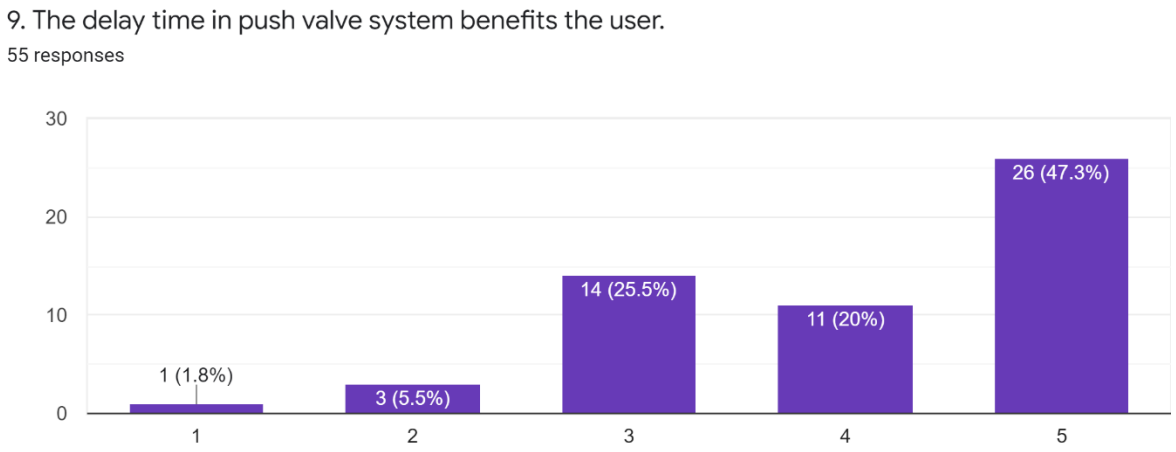


Figure 4.3.5: The delay time in the push valve system benefits the user.

From this bar chart, we can analyse the 26 respondents which resulted in 47.3% is strongly agreed and 11 respondents which resulted in 20% are agreed with the delay time in the push valve system. 14 respondents which is equal to 25.5% have placed the option good for this statement. However, 4 respondents disagreed and strongly disagreed with the statement with a percentage of 5.5% and 1.8% respectively. From this survey, we can understand that the delay system of our product is not familiar to the users.

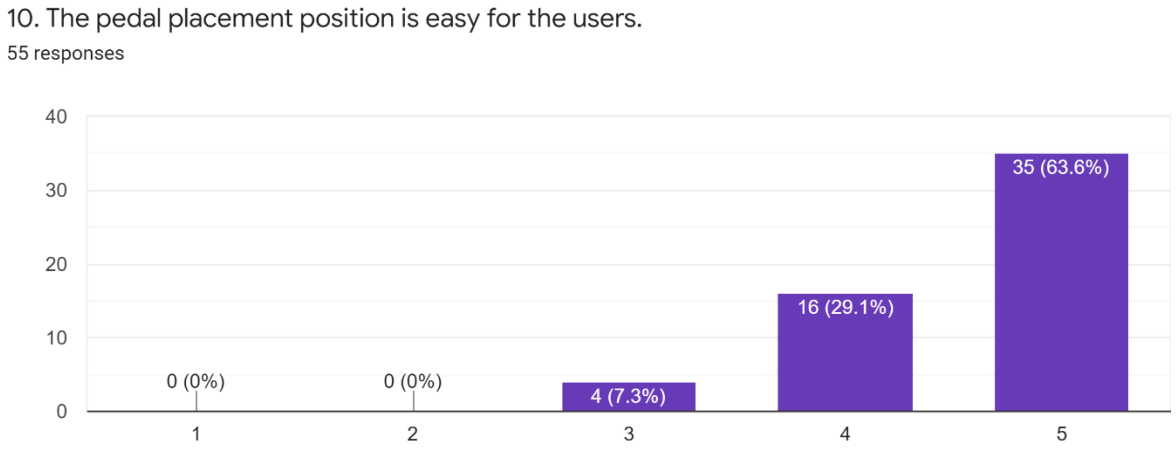


Figure 4.3.6: The pedal placement position is easy for users.

From this bar chart, we can analyse that majority of respondents were selecting the option strongly agreed with the rating of 63.6% which means 35 out of 55 respondents. It shows that our pedal placement position is easy to use by the users. However, 16 respondents agreed with the statement and 4 respondents stated the position of the pedal placement was good.

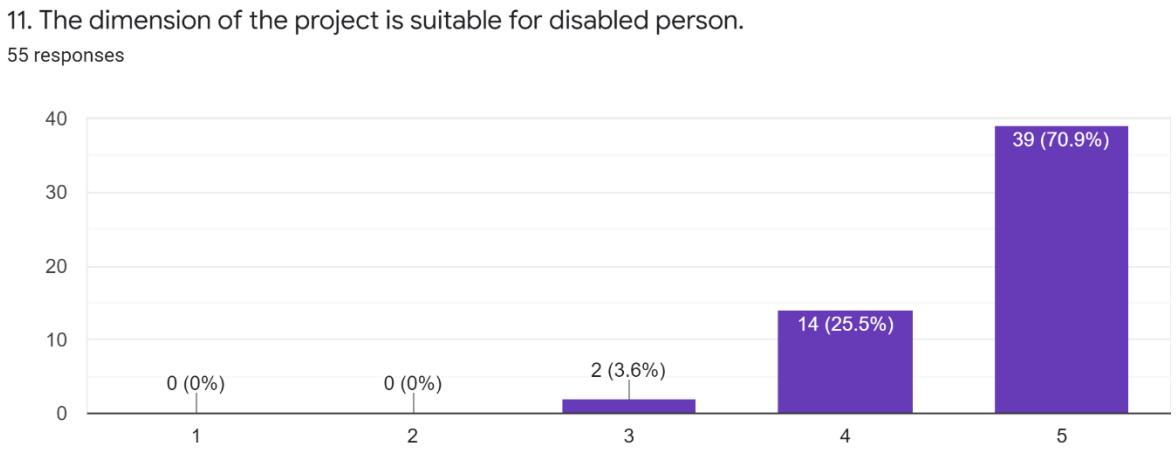


Figure 4.3.7: The dimension of the project is suitable for the disabled person.

This bar chart proves that the dimension of the project is suitable for a disabled person with a rating of 70.9% which equals 39 respondents who selected the option strongly agreed. 14 respondents agreed with the statement also supporting our dimension of the project. 2 respondents which equal 3.6% stated that the dimension is good and this is a good result for us.

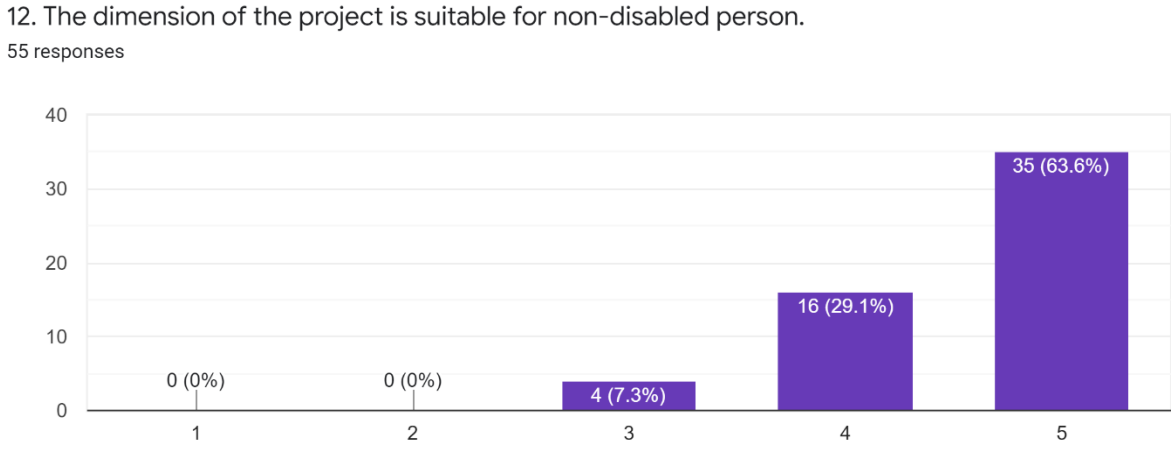


Figure 4.3.8: The dimension of the project is suitable for a non-disabled person.

This bar chart shows that almost all respondents agreed with the dimension that we made for non-disabled persons. 4 respondents mentioned that our dimension is good. Meanwhile, 16 respondents which are equal to 29.1% agreed with the statement above. Most of the respondents strongly agreed with our dimension and the respondent's quantity is 35 out of 55 which is 63.6%.

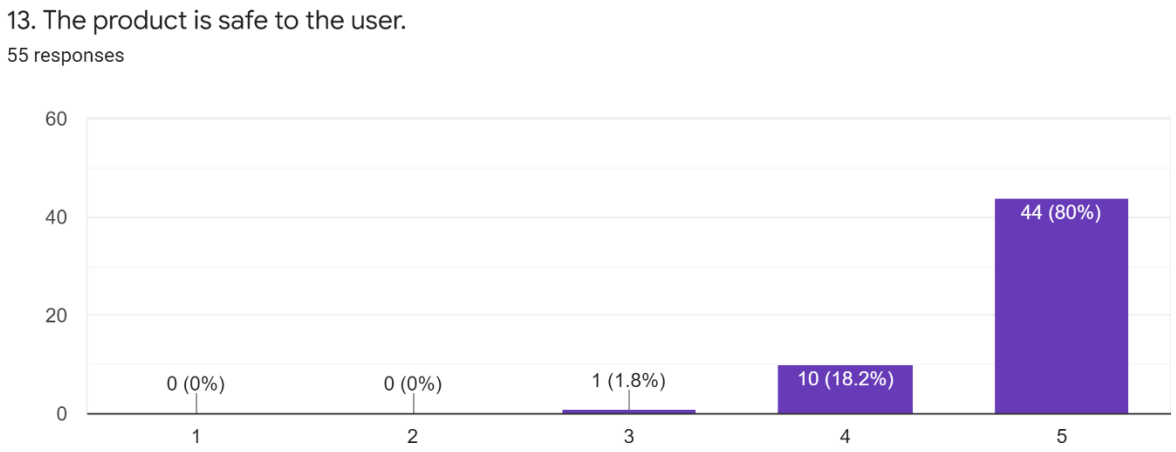


Figure 4.3.9: The product is safe for the user.

From this bar chart, we can understand that 44 people 80% of the overall respondents strongly agreed with the product is safe for users. 18.2% equal to 10 people just agreed with this statement. However, there is 1 person which equals 1.8% have stated good with this statement. 54 out of 55 respondents are agreed with this statement proves that the product is safe to use by the disabled and non-disabled users.

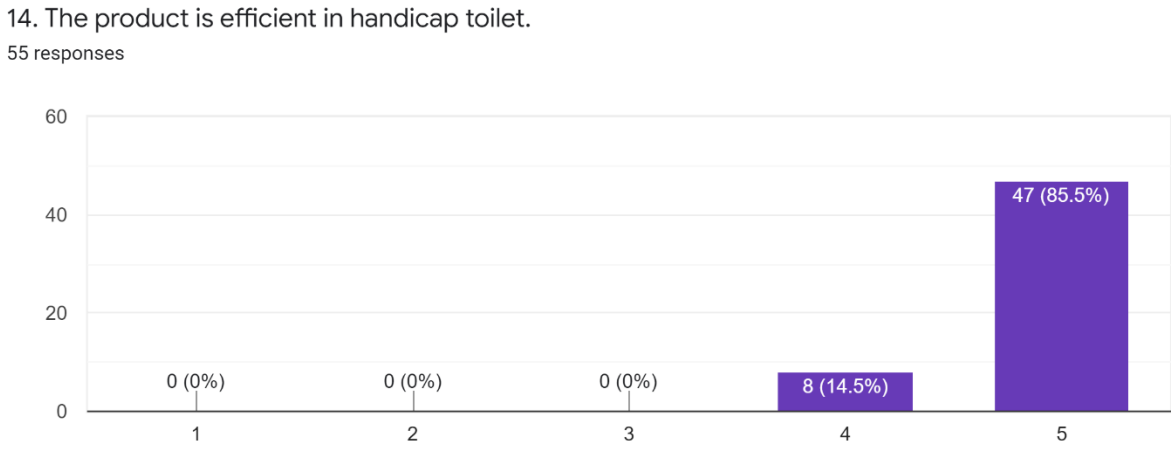


Figure 4.3.10: The product is efficient in handicapped toilets.

In this bar chart, all the respondents agreed and strongly agreed that our product is efficient in handicap toilets. 8 respondents agreed and 47 respondents strongly agreed with this statement. The percentage that has been recorded is 14.5% for those who agreed and 85.5% for those who strongly agreed.

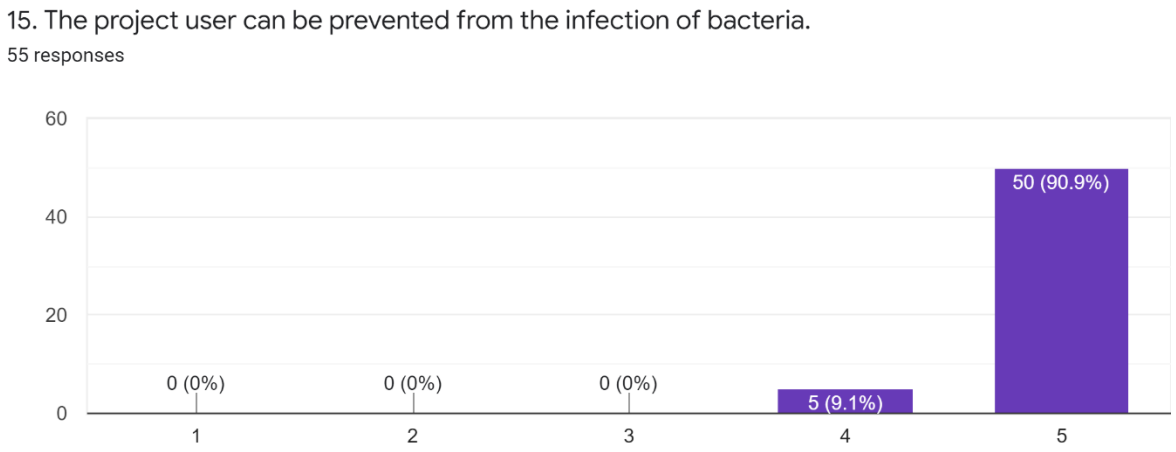


Figure 4.3.11: The project user can be prevented from the infection by bacteria.

This bar chart proves that our product users can be prevented the infection by bacteria. To support this statement there are 50 out of 55 respondents strongly agreed and a balance of 5 respondents agreed with the statement. The percentage of the respondents who strongly agreed is 90.9% and the respondents who agreed with the statement is 9.1%

4.4 respondent's opinion (feedback)

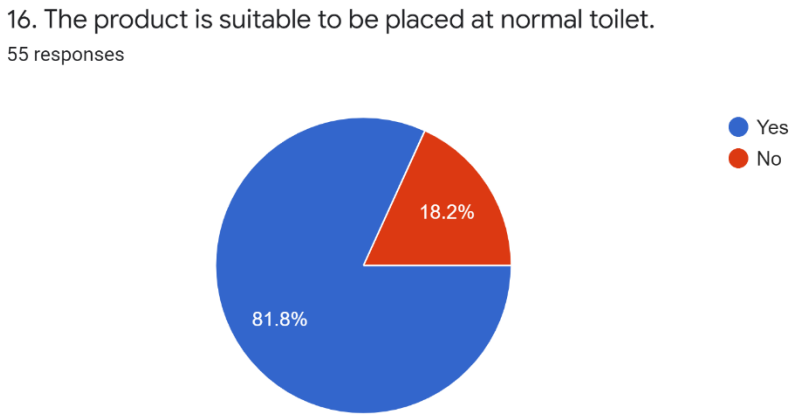


Figure 4.4.1: The product is suitable to be placed on a normal toilet.

As we can see that the pie chart shows the majority of respondents agreed the product is suitable to be placed in a normal toilet. The percentage of the agreed statement is 81.8%. Still, 18.2% of respondents disagreed with the statement. It shows the majority of respondents like to place our product in the normal toilets.

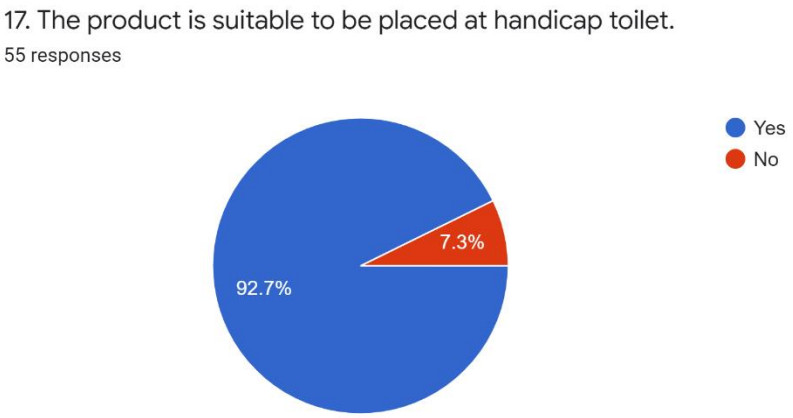


Figure 4.4.2: the product is suitable to be placed at a handicap toilet.

According to the pie chart above, we can analyse that 92.7% of respondents agreed to place our product in the handicapped toilet. However, few respondents disagreed with the statement. But the majority of the people supporting the statement

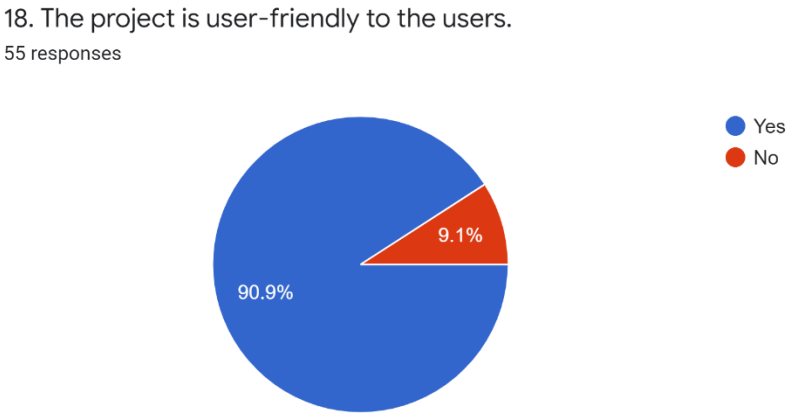


Figure 4.4.3: The project is user-friendly for the users.

Finally, 90.9% of respondents agreed that our product is user-friendly for the handicapped and the non-handicapped users.

4.5 Discussion

As shown in the above table there are 18 questions in the survey were conducted for this discussion part. They have been 55respondents' responses to this discussion. From the survey above's results we get to see that the leg actuated water tap system has potential in the market and also serves the purpose of the product based on the response from the community of Taman Tennamaram. As result, from the survey, the durability of the product is achieved at 81.8%. This is because our product is made of stainless-steel plates, big and heavy-duty valve which was fabricated. In addition, the dimension of the project has received a good response which is 70.9% because of the customization done for both non-disabled and disabled people. 80% of the respondents have supported the safety of using this product. Users can safely use the product without any contact with their body parts through the leg-actuated water tap system. This shows that the users are safe from the infection of bacteria and other infectious diseases. For this statement, there is a supportive factor which is 90.9% that has been responded by the respondents.

4.6 summary

As a summary of the research and data analytics, the survey and questionnaire methods are used to collect the data from the random people above helping to build the Leg Actuated Water Tap System. The product has received a good response from the respondents from the Taman Thennamaram community who are disabled and non-disabled. Overall, we get to know that this product is suitable and efficient to be published in the market of water tap systems.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

For this chapter, the decisions made are based on all results obtained from the experiments conducted and the discussion in the previous chapters. In this chapter as well, the relevant thing is regarding the objectives of the study as well as recommendations for the study conducted. In addition, conclusions were drawn from this experiment.

5.2 Conclusion

The main objective of this study was to construct a troubleshoot for the problem faced by the toilet user. For the problem we have found out which is handicapped individuals who face difficulties using the ordinary toilet. Data collection and information on using our product is through from survey. Research on the site is done to prove that the leg-actuated water tap system is beneficial to all the toilet users.

In this study, the satisfaction of the users is more focused to fabricate our product and check its effectiveness among users. Most of the responders on the survey give a satisfactory opinion toward the leg-actuated water tap system. It shows that our product can reach the public very easily. Other than that, our product design also satisfied the users. This product requires low cost in maintenance and is easy to use. In addition, the workforce required in the manufacturing proses of this product is a total of three people. Most of the materials are made from stainless steel plates than can long last and rust proof. The valve that is used in this project is also a heavy-duty valve to long last its lifetime.

The overall conclusion that can be made from this research is the leg-actuated water tap is beneficial to handicapped users and non-handicapped users. For that statement above we are successfully reached our objective and the problem faced by the handicapped toilet users can survive with our product in their private space.

5.3 Recommendation

From the questionary, there is a recommendation to upgrade the product for all kinds of handicapped users such as blind people. So, the suggestion for future upgrades is to give attention to the blind people to operate the water system by adding a few mechanisms which

help them to operate the leg-actuated water tap. All kinds of handicapped users can use our product easily in the future.

5.4 Summary

Results from the research that has been conducted on leg actuate water tap system efficiency, are concluded that the objective of the research has been achieved. The leg-actuated water tap is built up and over 2 months it is placed for public use. From that, the survey was conducted and the conclusion is made.

REFERENCE

1. Roubi A. Zaied “Water use and time analysis in ablution from taps”, Applied Water Science, doi: 10.1007/s13201-016-0407-2, 2016.
2. Shaaban M. Shaaban and Roubi A. Zaied, 2014, Evaluating the Parameters Affecting Rationalization of Water Consumption in Ablution, Scholars Journal of Engineering and Technology (SJET) 2(3A):326-334.
3. total Restitution Using Simple Technology & Techniques, retrieved in July 2016 from: http://watermiser.hpage.com
4. Johari NH, Hassan OH, Anwar R, Kamaruzaman MF (2013), A Behaviour Study on Ablution Ritual among Muslims in Malaysia, Procedia-Social and Behavioral Sciences. doi: 10.1016/j.sbspro.2013.12.002.
5. Besari ARM, Zamri R, Yusaeri A, Palil MDM, Prabuwono AS (2009) Automatic Ablution Machine Using Vision Sensor. IEEE Symposium on Industrial Electronics and Applications (ISEA 2009). Kula Lumpur. pp: 506-509.
6. Al-Mughalles M H, Abdul Rahman R, Suja F B, Abdullah S M S (2012) Mosque Greywater Quantity in Sana'a, Yemen. Electronic Journal of Geotechnical Engineering. 17(Bunk):1593-1603. Available at: www.ejge.com/2012/Ppr12.130e.pdf
7. Bill Randolph and Patrick Troy (2008) “ Attitudes to conservation and water consumption” . ELSEVIER
8. C.R. Ramakrishnaiah (2014) “ Urban water management: best practice cases”. Scientific research publishing Inc.
9. ArjunWagh and Rani Shinde (2017) “ Modern methods of water conservation in India”. Research front.
10. F. Abu- Taleb and Maher M. Murad (1999) “Use of focus groups and surveys to evaluate water conservation campaign” . Journal of water resources planning and management.
11. Gary A. Gagnon (1984) “ The role of water audits in water conservation” . Journal of water resources planning and management.
12. Yixing Shan, Lili Yang, Kim Perren, Tannin Zhang (2015) “ Household water consumption: insight from a survey in Greece and Poland”. Science direct ELSEVIER.
13. Yushiou Tsai, Sara Cohen, and Richard M.Vogel (2011)“The impacts of water conservation strategies on water use” . Journal of American water resources association.

ATTACHMENT

Survey form

1. What is your name?

Your answer

2. What is your age group?

- 1-20
- 21-40
- 41-59
- 60 and above

3. What is your gender?

- Male
- Female

4. What is your race?

- Indian
- Malay
- Chinese
- Other:

5. The difficulty faced by the handicap toilet users with the normal water tap system.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

6. The normal water tap system is challenging for the wheelchair users.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

7. The design is suitable for disabled person.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

8. The design is suitable for non-disabled person.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

9. The delay time in push valve system benefits the user.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

10. The pedal placement position is easy for the users.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

11. The dimension of the project is suitable for disabled person.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

12. The dimension of the project is suitable for non-disabled person.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

13. The product is safe to the user.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

14. The product is efficient in handicap toilet.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

15. The project user can be prevented from the infection of bacteria.

	1	2	3	4	5	
Strongly disagree	○	○	○	○	○	Strongly agree

16. The product is suitable to be placed at normal toilet.

- ○ Yes
- ○ No

17. The product is suitable to be placed at handicap toilet.

- ○ Yes
- ○ No

18. The project is user-friendly to the users.

- ○ Yes
- ○ No

Submit Clear form

Gantt chart 1

TOPIC	WEEK1	WEEK2	WEEK3	WEEK4	WEEK5	WEEK6	WEEK7	WEEK8	WEEK9	WEEK10	WEEK11	WEEK12	WEEK13	WEEK14
Group members selection														
Project title selection and project supervisor														
Paper preparation for project proposal														
Paper review of project proposal														
CHAPTER 1														
INTRODUCTION														
BACKGROUND OF THE PROJECT														
PROBLEM STATEMENT														
OBJECTIVE														
SIGNIFANCE OF STUDY/RESEARCH														
EXPECTED RESULT														
SUMMARY														
CHAPTER 2														
INTRODUCTION														
COMPREHENSIVE WRITING OF PREVIOUS RESEARCH RELATED TO THE INTENDED TOPIC.														
SUMMARY OF THE INVENTION														
CHAPTER 3														
INTRODUCTION														
RESEARCH DESIGN														
SUMMARY AND OVERALL CHECKING														

Gantt chart 2

TOPIC	WEEK1	WEEK2	WEEK3	WEEK4	WEEK5	WEEK6	WEEK7	WEEK8	WEEK9	WEEK10	WEEK11	WEEK12	WEEK13	WEEK14
Course registration														
Final report writing														
Project fabrication														
Project assembly														
Project testing														
Project final touches														
Conducting survey														
Survey result analysis														
Data analysis attachment														
Project progress presentation														
Presentation preparation														
Abstract checking by supervisor														
Technical paper checking by supervisor														
Abstract checking by English lecturer														
PITEX JKM Video, technical paper, poster, Abstract (after revision)														
Final Report and log book submission														