UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF KEEP WARM FOOD DELIVERY BAG

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BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PROCESS AND TECHNOLOGY) WITH HONOURS)

2021

Faculty of Mechanical and Manufacturing Engineering Technology

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A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours

Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this thesis entitled "Design and Development Of Keep Warm Food Delivery Bag" is the result of my research except as cited in the references. This thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours.

Signature : 

Supervisor Name : TS. SYAHRUL AZWAN BIN SUNDI @ SUANDI

Date : 17/01/2022

DEDICATION

Dedicated to

My honourable father, Wan Zamani Bin W Idris,

My lovely mother, Siti Zaleha Binti Ali,

My supportive brothers, W Mohd Safwan Bin W Zamani, W Mohd Sahlan Bin W Zamani,

W Mohd Saifuddin Bin W Zamani, W Muhammad Salman Bin W Zamani and Wan

Muhammad Syakiran Bin W Zamani,

My sweet sister, Wan Suhaila Binti W Zamani.

Thank you very much.

ABSTRACT

This thesis presents the materials, systems, and design processes of keep warm food delivery bags for the food delivery industry. These keep warm food delivery bags are equipment used by food delivery riders to provide food delivery services in restaurants, the product target group covers all customers, especially food delivery companies. Since most food delivery services are now motorcyclists, this Keep Warm Food Delivery Bag is designed specifically for motorcyclists. One of the problems that need to be discussed is the design of the backpack because if the design is not suitable, it will make it difficult for the user. The selection of materials for thermal bags has also been investigated because the wrong use of materials can cause damage to food. For this product, oxford fabric and pearl cotton have been used as the exterior material. Oxford fabric is wear-resistant, stain-proof, and easy to clean on the inside. As for the interior material, this product use polyurethane foam (PU) insulation and aluminum foil. Polyurethane (PU) foam insulation has many benefits such as resistance to water and moisture, maintaining temperature, low thermal conductivity, and more. The inside of the bag must be at an appropriate temperature for the food. The food business has grown exponentially, the food delivery bags available in the market are not up to date. Many improvements can be made to improve the quality of the bags and meet customer demand. For example, this product adds a heating system by using a pad heating element that is charged using a power bank and adding a cup holder on the beverage section to prevent water from spilling. The products presented in this thesis will add value to the target group, as they are based on the fulfillment of user experience research. The design process was analysed through questionnaires from riders and literature review.

ABSTRAK

Tesis ini membentangkan bahan, sistem dan proses reka bentuk produk ini untuk industri penghantaran makanan. Beg penghantaran makanan ini adalah peralatan yang digunakan oleh penunggang penghantaran makanan untuk menyediakan perkhidmatan penghantaran makanan di restoran, kumpulan sasaran produk meliputi semua pengguna terutamanya syarikat penghantaran makanan. Memandangkan kebanyakan perkhidmatan penghantaran makanan kini adalah penunggang motosikal, produk ini direka khusus untuk penunggang motosikal. Salah satu masalah yang perlu dibincangkan adalah reka bentuk beg galas kerana jika reka bentuk tidak bersesuaian, ia akan menyukarkan pengguna. Pemilihan material untuk thermal beg juga telah diselidik kerana jika penggunaan material yang salah boleh menyebabkan kerosakan kepada makanan. Untuk produk ini, kain oxford dan kapas mutiara telah digunakan sebagai material luaran. Kain oxford tahan haus, kalis kotoran, dan mudah dibersihkan di bahagian dalam dengan kapas mutiara. Manakalah pada material dalaman, produk ini menggunakan penebat buih poliuretana (PU) dan aluminium foil. Penebat buih poliuretana (PU) mempunyai banyak faedah seperti ketahanan terhadap air dan pelembapan, mengekalkan suhu, kekonduksian haba yang rendah dan banyak lagi. Dalaman beg mestilah berada pada suhu yang sesuai dengan makanan. Perniagaan makanan telah berkembang pesat, beg penghantaran makanan yang terdapat di pasaran tidak terkini. Banyak penambahbaikan boleh dilakukan untuk meningkatkan kualiti beg dan memenuhi permintaan pelanggan. Contohnya produk ini menambah sistem pemanasan dengan menggunakan elemen pemanas pad yang dicaj menggunakan powerbank dan menambah pemegang gelas pada bahagian minuman untuk mengelakkan air daripada tumpah. Produk yang dibentangkan dalam tesis ini akan menambah nilai kepada kumpulan sasaran, kerana ia berdasarkan pemenuhan penyelidikan pengalaman pengguna. Proses reka bentuk dikaji melalui soal selidik daripada penunggnag dan kajian selidik.

ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

First and foremost, I would like to express my deepest appreciation to all those who provided me the possibility to complete this report. I would like to express my heartfelt appreciation to my final year project Supervisor, Mr. Syahrul Azwan Bin Sundi @ Suandi for his invaluable assistance and all his support in completing my project especially in writing this report. I am very thankful for his invaluable guidance and support throughout these two semesters. His constant patience for guiding and providing priceless insights throughout the semester will forever be remembered and appreciated.

Last but not least, from the bottom of my heart I would like to express my grateful and appreciation for all of my teammates which are Afiq Asna, Mas Naninerina, Nur Hanizah, Aidil, and Amier who gave me some suggestions and advice in this project. I also dedicate this dissertation to my friends who know me from UTeM or social media who have supported me throughout the process. Finally, thank you to all the individuals (s) who had provided me with the assistance, support, and inspiration to embark on my study.

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CHAPTER 1

INTRODUCTION

1.1 Background

The food delivery business is rising exponentially because of the convenience for customers. To enhance their business vision, several fast-food restaurants provide delivery services. This is an effective way to increase business because a lot of customers order food from delivery services online. In commercial sectors, a variety of delivery bags are currently available. The large bulk of them has trouble keeping food heated and avoiding moisture. During delivery, moisture might have an impact on the quality of food. It is feasible and desired to improve delivery bags to provide better service to customers to appeal to this rising industry (A. Hasan and Dincer, 2019).

The food bag market is less competitive as the sector grows. There is currently a global market for the goods, and as food transportation patterns continue, consumer equipment enhancement and production will become increasingly vital (Kuljetukseen, 2018). There are no exact estimates for the extent of their Australian business, however, both platforms provide self-reported data: Uber claims to have 80,000 'delivery-partners' throughout its ridesharing and food delivery services, whilst Deliveroo claims to have 3000 self-employed delivery-riders (Veen, Barratt Goods, 2020).

After the spread of COVID-19 in our country, it has transformed the way of life of the community into a new normative environment where most activities are done by online, including ordering food. Various initiatives have been undertaken by the government to ensure that not only is the pandemic eradicated as soon as possible, but also the survival of the individual can be continued. One of them, the government announced to implement the

Movement Control Order (MCO) after the disease was on the rise. This causes many people to use food delivery services as it simplifies their work and saves their time. In addition, the MCO is implemented to protect the general public from spreading the pandemic and help reduce the spread of COVID-19.

When the Movement Control Order (MCO) was in effect, it was naturally more difficult for individuals to crave some favorite foodstuff, particularly if this restaurant required going outside more than a 10 km radius permitted. Due to a variety of circumstances, this was the government's response during the MCO. In consequence, a lot of people ordered food through food delivery services like Grab Food and Food Panda at the start of the MCO, with network scans showing an increase in the amounts of orders each rider was handling. According to Grab Malaysia country head Sean Goh, saw the multi-app company enlisting its Grab drivers as food delivery drivers. People are adapting due to the MCO. In the beginning, about 80 % of customers get their orders delivered to them, with the remainder opting for self-pickup. Over the MCO, these figures have gradually reversed, with about 80 % now opting for self-pickup towards the end of Phase 3 operator.

When deliveries are delivered in colder areas, better delivery bags are critical, as brief exposure to cold temperatures can drastically reduce interior temperatures and create condensation. The most significant aspect in improving the heat retention performance of delivery bags is the types of thermal insulation material. Thermal insulation can reduce the rate at which heat is transferred from the inside of the bag to the outside surface by using a material with low thermal conductivity. Many insulating materials are already available that can perform adequately in the insulation of a delivery bag and keep it warm for hours. Deliveries from restaurants and fast-food places are expected to keep food hot and fresh (A. Hasan and Dincer, 2019).

The purpose of bag delivery is to keep the food warm or cold until it's time to eat it. Hot and crispy foods release latent heat and cool down during production and consumption. In contrast, concluded that food delivery bags should be a high concern. It is a smart way to keep food fresh through the delivery process (Neal, 2003).

1.2 Problem Statement

Keep Warm Food Delivery Bag is the equipment that used for food delivery riders to serve a food delivery service in a restaurant and independent food-delivery business. Bag packs are vital items for motorcycle riders since, unlike cars, motorcycles do not have enough storage compartments. But this is not the only issue; riders frequently complained that the backpack's design made it difficult to reach while riding (Rekha, 2020). Safety is very important for food delivery. The food delivery bag was too large to carry and caused the rider to be unable to see behind due to blocked side mirror vision. This can pose a risk of accident or friction with the car.

Insulation materials are major elements for effective heat retention. Thermal insulators use materials with low thermal conductivities to retain heat by reducing the speed of heat transmission from the inside of the bag to the outer surface (A. Hasan and Dincer, 2019). The use of unsuitable material and system bags is also one of the causes of problems encountered. These causes make customers disappointed in receiving food that is not hot.

Stability is an issue that should be resolved. The food delivery bag is always moving if the rider moves, plus if there is a bump or the rider avoids the pothole. If food or drink spills, it poses a risk to the rider as all that is under his responsibility and will make the customer unsatisfied.

1.3 Objective

To ensure that this project satisfies the goal and requirements, it initiated by concentrating on a few main objectives to achieve which are as listed:

a) To make the size of the delivery bag suitable to ensure safety and convenience for the riders while riding.

b) To provide high-quality delivery bags and trustworthy. The bag works well and keeps warm at the appropriate temperature for more than 4 hours by using a heating pad system.

c) To design a food delivery bag that makes it easier and safer for riders to use the bag with improvements on the beverage section

1.4 Scope of Research

The main focus of this project is on:

a) The focus of this bag is created for motorcycles, especially in terms of size and design. Motorcycles are the most suitable vehicle used to make food deliveries as they can avoid road congestion and take a short time to reach the destination. The delivery costs are also cheaper than other vehicles.

b) This bag uses suitable materials and is designed for various types of food and beverages whether hot or cold including fast food, hot food, hot and cold drinks, pizza, and so on.

c) To study the detail of the existing insulation bag by making a questionnaire to the food delivery rider to get the data.

d) To ensure that this prototype developed will be achieved based on objective and meet the need of users.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the related journal, understanding, and findings of previous research. This is one of the ways to get more understanding about this product. It is because it can help to find suitable material, types of closure, and anything else. The information gathered will become an additional source for the project and do the improvement. A few literature reviews were researched and evaluated to gain a thorough knowledge of this product.

2.2 Concept of Bag Delivery

The concept of a food delivery bag is to maintain food warm during delivery. Food delivery bags are thermal bags designed for food riders to carry food and deliver food to customers. This bag is heat insulated and has a waterproof capability. Thermal food delivery can maintain the temperature of hot food and keep food warm in the bag. In the subject of food packaging, there are several significant variables to consider, including food quality and freshness preservation, a pleasing appearance, good marketing appeal, proper product identification, storage and distribution convenience, and product identification accuracy (Siracusa *et al.*, 2014).

In comparison to the control delivery bag, the airbags had a 2 to 4 % improvement in thermal retention energy and exergy efficiency. The “airbags” with no ridges had the best thermal retention performance. The maximum energy and energy efficiency attained were 88.7 % and 83.2 %, respectively, compared to 86.7 % and 81.8 % for the control bag. In

summary, the air-insulated bag outperformed the control bag. Another advantage of the air-insulated bag is that it would be less expensive to make because the majority of it is made of air and the structure is made of inexpensive polyurethane foam (Ahmed Hasan and Dincer, 2019).

2.3 Advantages of Food Delivery Services

Home delivery services for restaurant orders have developed beyond pizza restaurants to other restaurant categories as a result of the advancement of digital technology, and ordering meals via apps and websites has become widespread. Apps that allow users to order a range of restaurant meals at home or work in just a few seconds have become extremely popular among city residents in today's fast-paced world (Kuljetukseen, 2018).

Online food ordering allows customers to place an order anytime, from anywhere, and greatly saves time typically spent picking up food. Another advantage of the food delivery offer from the online food ordering facility for customers is the ability to place food orders and favourite food orders easily. In addition, it can reduce waiting time in restaurants, and improve the accuracy of food orders made. With the advantages offered to customers, it can improve your connection with them and eventually result in a higher frequency of food orders.

In addition to customers, restaurants gain from transportation services, with some already adopting home delivery services. Restaurants and cafes will benefit from delivery services. Thousands of restaurant orders are already being dispatched every day in Finland, and broadcasts have recently become a part of the downtown street scene (Salminen *et al.*, 2017).

Although a few months ago, limiting the customer presence during restaurant operations was the only option, during the COVID-19 pandemic, it has become a priority.

While COVID-19, by minimizing customer presence, has the potential to protect customers, employees, and the general public from the spread of the virus. But even if the spread has diminished, customers may continue to enjoy the services offered by online ordering as it can accommodate hectic schedules and allow them to securely purchase a variety of foods to eat with spouses, loved ones, and colleagues.

The majority of online ordering apps and services offer appealing promotions that not only make your current customers satisfied but also help you acquire new customers. Whether online food ordering is hosted on a website or through a third-party service, offering promotions that entice customers can help generate more sales customer also will satisfaction. For customers, online ordering also provides an opportunity to make dining choices close to them and allows them to explore restaurants and foods they may not have known before.

When entrepreneurs began linking restaurants and consumers with their courier services around 5 years ago, the food transportation market shifted dramatically. In recent years, the number of internet food orders has increased dramatically. In the future years, the billionth firm is likely to continue to develop at a rapid pace (Kuljetukseen, 2018).

Although there are no exact estimates accessible for the extent of their Australian operations, both platforms provide self-reported data: Uber claims to have 80,000 'delivery-partners' throughout its ridesharing and food delivery services, and Deliveroo claims to have 3000 (Veen, Barratt and Goods, 2020).

2.4 Function of Keep Warm Food Delivery Bag

Food delivery is more popular than ever, and customers expect chefs and restaurant owners to provide a high-quality restaurant experience within their own homes. This means sending the food in the same condition during which it was received from the restaurant.

However, once the food is collected from the restaurant, the food is no longer as warm as freshly cooked. Packaging systems are designed to preserve the advantages of food processing after it has been completed, allowing foods to travel securely over great distances while being healthful at the time of consumption (Marsh and Bugusu, 2007).

The main function of a food delivery bag is to keep the food warm. High-quality heat-insulated bags will maintain the correct food temperature while controlling humidity levels. The insulated thermal bag is capable of blocking external heat and trapping internal heat inside the thermal bag carrier space. The journey from the restaurant may take a long time to reach the customer's home. The importance here is the layer, foam insulation between the outer layer and the inner layer is what keeps the food warm and safe. The type of bag closure and quality materials are also factors in ensuring food keep warm and consistent during delivery. Waterproof food delivery bags will protect food from getting wet. With food delivery bags, food will stay warm for a long time and customers will be satisfied.

One of the functions of a food delivery bag is to make it easy for riders to deliver food right to the destination. Hot food will arrive hot and quick while cold food will arrive without thawing or spilling. If the rider does not have a bag, it will make it difficult for the rider to deliver food, especially if obtaining many orders. Food delivery bags are very important as they can help deliver food to customers and guarantee all customers get quality service. In addition, it can maintain the temperature at an appropriate level. It must provide good quality and service to maintain customer loyalty. It is critical to conduct a thorough investigation into consumer perceptions to provide better services (Chandrasekhar, Gupta and Nanda, 2019)

Whatever the job, safety is very important and should be a priority. In this case, riding a motorcycle on the road requires full focus. If the rider does not have a bag, it can cause the rider to lose focus because he has to think about the food situation. Even if the delivery driver

is an experienced driver and is always careful, it can still pose a risk or danger. This is because it can lead to an accident if the focus is lost, for example too late to avoid other vehicles or not noticing a pothole. So, food delivery bags are equipment that food riders should have to ensure safety.

2.5 Importance of Keep Warm Food Delivery Bag in Industry

Riders consider a delivery bag to be an essential item, unlike a car, motorcycles do not have enough storage spaces. A market study was conducted, and the results revealed that the product's market size will increase from year to year. The evolution of food delivery services, socio-economic trends, and riders' consent to safety are some of the elements that may contribute to this increase (Rekha, 2020). Warm food delivery bags are important in the industry. This is due to the increasing demand for direct home delivery of food. Food quality is one of the most important things that food businesses need to pay attention to material and closure. Bag delivery food is important to protect the food contents from any damage. These bags are also available in a variety of sizes and shapes for a variety of purposes. It also includes a waterproof liner that prevents moisture damage and the ability of the cells in which your food will be stored to keep from getting wet. It is one thing to keep food supplies warm or hot from the pickup point to the delivery point, but if the humidity is not controlled, your customers will receive wet and unpleasant food. Insulated food delivery bags keep food warm while also keeping moisturize at a minimum, ensuring that food delivery does not become wet by the time it reaches your customer. Hot and cold for food or beverages in their respective packaging can be kept at the proper temperature in insulated delivery bags until complete delivery. The food bag market is less competitive as a result of the expanding business. The product now has a global market, and as food transportation trends continue,

consumer equipment development and production will become increasingly significant (Kuljetukseen, 2018).

In recent years and specifically during the COVID-19 pandemic, online food ordering has changed from the desired convenience to a mandatory requirement for business survival. Many people use food delivery services because it simplifies their work and save their time. It also has many options available; they can choose from various types of restaurants and food delivery services. Food delivery services help restaurant operators, the public, and other food vendors to promote their food to customers. This can also help small food traders to run their businesses by selling their food. This is the best way to reach customers

In addition, the health crisis that is plaguing the world has affected the country's economy. The unemployment rate in Malaysia rose to 5.5 percent or more than 860,000 unemployed according to projections released by the Department of Statistics Malaysia last May. As such, those who lost their jobs have registered themselves as food delivery men to cover the cost of expenses. This result is increased demand for food delivery bags.

2.6 Design Food Delivery Bag in Malaysia

The design of food delivery bag has two parts that need to be researched which is exterior design and interior design. In the exterior design, the shape of the bag and the type of closure bag are very important in the design of the product. While at the interior of the bag, the position of the partition to separate the inside of the bag will be discussed.

2.6.1 Exterior design

Most type of delivery bag is square and rectangular. It is for the balance and suitability of the motor user. Size is usually made not too large for the safety of the user.

Moreover, this square-shaped bag is designed to make the bag more stable and difficult to drop. This shape also has a large space compared to other forms. In addition, the square or rectangular shape has a neat and easy interior space for arranging food. Table 2.1 shows the shape of the food delivery bag in Malaysia is square and rectangular design.

Table 2.1: The exterior shape of food delivery bag in Malaysia

No.	Types of the delivery bag	Picture
1.	Food Panda	
2.	Grab Food	
3.	Mc Donald	
4.	Pizza Hut	

No.	Types of the delivery bag	Picture
5.	KFC	
6.	Shopee food	
7.	Air Asia	
8.	Bungkusit	

The insulated food delivery bag's function is to guarantee that foods retain as much heat or keep as cool as possible from the kitchen to the customer. A high-quality bag closure is critical to achieving this goal. Closures serve to secure food in place for little movement during travel, in addition it to keeping the heat in the bag.

There are two example designs of bag closure, which are the closure from the top and the closure from the side. Both bag closure has a similar function which is to facilitate the user. The closure from the top is typically used for food delivery riders who get order a variety of foods and beverages from customers because each food has a different shape. While closures from the sides are typically used by pizza food deliverers, pizzas have a large width size and are not high. Table 2.2 shows the type of closure for food delivery bags.

Table 2.2: Type of closure food delivery bag

Closure from the top	Closure from the side
	
	
	
	

Closure from the top	Closure from the side
	

2.6.2 Interior design

The interior of food delivery bags in the industry has many types of design. The position of the partition in the bag typically has a function; for example, if the partition is oriented horizontally, it is usually a pizza design. The organization of space in the food delivery bag is essential since the improper design may make it difficult for the rider to place the food. The space in the interior for Table 2.3 shows the interior design for food delivery bags in the industry.

Table 2.3: Interior designs food delivery bag

No.	Interior design	Description
1.		Has partitions on the inside and is placed horizontally.
2.		Has a partition in the middle of the bag to separate some internal part.

No.	Interior design	Description
3.		Has no partitions and has a large space.

2.7 Types of material

The most essential thing for food delivering service is type of material of bag. In addition, to the product's thermal insulation, the order's quality may be maintained by using the most stable method of transportation. For example, hygiene regulations, it has an impact on the materials and forms of items available. Many fabric items employ materials that are extremely similar to or identical to the food conveyor bags. The material used an attractive because it effectively shields heat while still being affordable, flexible, and long-lasting, even under extreme conditions. I look at different surface materials, in addition to structural components, to solve difficulties with safety, waterproofing, and aesthetics (Kuljetukseen, 2018).

The effective thermal conductivity of multilayer insulation materials was investigated experimentally. In the following domain (0 to 25 °C), the ETC was evaluated as a function of temperature. Binary/ternary glass wools or ternary expanded polystyrene foams reinforced with aluminum foil were among the materials studied. Heat retention requires the use of thermal insulation materials. Thermal insulators use materials with low thermal conductivities to help retain heat by slowing the pace at which heat is transmitted from the inside of the bag to the outer surface. (Ahmed Hasan and Dincer, 2019).

2.7.1 Exterior material

Bags would prefer to be protected from inclement weather. In this regard, the exterior fabric plays a significant influence. As a result, the fabric of the bag must be pushed to be not only waterproof but also water-resistant so that the bag does not become too heavy. The material must be treated with a hydrophobic coating to prevent it from becoming damp and eventually leaking into the bag. To prevent water from entering the bag, all seams, zippers, stitching, and fabric joints should be coated.

Vinyl and nylon are the two most common materials used on the exterior of food delivery bags. Both choices are water-resistant, making them perfect for food delivery in any weather. However, insulated food delivery bags made of nylon are generally more costly than those made of vinyl. This is generally because the nylon type is more breathable and allows for a controlled release of moisture, which means fresher food, and the ideal choice for long-distance food delivery. On the other hand, the vinyl options are not as great for handling moisture, only suitable for short-distance food deliveries. Besides, oxford cloth is very suitable for food delivery bags because oxford cloth is a lightweight, waterproof material, and also incredibly resilient and resistant to damage and filth. Oxford polyester materials with a specific PU coating and waterproof finishing are perfect for all types of waterproof bags, tents, coverings, and roofs.

2.7.2 Insulation foam material

The main components for effective heat retention are insulation materials. Thermal insulators use materials with low thermal conductivities to help retain heat by reducing the rate at which heat is transmitted from the inside of the bag to the outer surface. Currently, a variety of insulation materials are capable of adequately insulation delivery bags and keeping it warm for an extended period (A. Hasan and Dincer, 2019).

Food delivery bags are made of a form of foam insulation that ranges in thickness from 25.4 mm to 50.8 mm, with the thicker material contributing to food keeping hotter for longer. PVC (polyvinyl chloride) is a low-cost, long-lasting foam insulation material. It is grease and chemical resistant, which contributes to high durability. Polyurethane (PU) foam insulation is more durable than PVC. PU is also more lightweight, flexible, and resistant to odors.

The trade-off is its increased price point. Polyester is the most costly than other and third most preferred insulation material for food bags. This material keeps all of the most useful characteristics of PU while also adding the ability to be highly strong and resistant to harm. One of the most important elements for restaurants and line of work enterprises is to provide food hot and fresh. As a result, bags must be adequately insulated to keep the food hot and fresh for a prolonged delivery duration and to ensure customer satisfaction. Table 2.4 shows an example of how the bag is insulated.

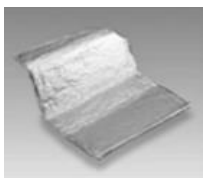
Table 2.4: The example of how the bag is insulated.

No.	Material	Description
1.	Aluminum foil	It helps to reflect heat radiation into the bag, which serves to protect against it.
2.	Closed cell foam	Affects both conduction and convection heat transfer methods. The closed-cell foam creates very small air pockets that prevent air from flowing from one spot to another.
3.	Corrugated plastic	It is used for its structural strength, lightweight, and insulating properties.

No.	Material	Description
4.	Expanded foam	An extra layer of standard foam protects the bag's fabric while also adding to the bag's aesthetic look and feel.

In delivery bags, foam insulation keeps hot foods warmer for longer. With its high insulation properties, it is located between the outer layer of fabric and the inner lining of the bag, serving to minimize heat conduction. Closed-cell and open-cell foam insulation are also available, with the closed-cell being a superior insulator but substantially more costly, heavy, and stiff than open-cell foam. Open-cell foam is less costly than closed-cell foam, lighter in weight, and easier to compress, making it an excellent choice for insulation delivery bags in food service applications. Insulation materials are assessed primarily based on their low thermal conductivity, humidity response, and life cycle environmental effect. A summary of some insulation materials is shown in Table 2.5.

Table 2.5: Insulation materials properties and description.

No.	Name	Thermal conductivity (W/m K)	Thickness (mm)	Description
1	Vacuum insulation panel 	0.042	12	• High levels of thermal insulation • It is flexible as it is made up of elements.

No.	Name	Thermal conductivity (W/m K)	Thickness (mm)	Description
2	3M thinsulate 	~0 042	12	• Frequently used in winter coats • Diffusion characteristics for moisture
3	Polyurethane foam 	0.026	25	• Provides outstanding insulation • Easily accessible • Affordable price

2.8 Summary

Briefly, this literature review contains articles, diagrams, and tables depending on the project work that is useful in selecting the ideal material, design, and function. Data from the research were used to determine techniques for completing the project and proceed with the methodology. Nicer delivery bags are especially important in colder climates, where even brief exposure to low temperatures may drastically reduce interior temperature and promote condensation. Insulation materials are critical components for effective heat retention. Maintaining a greater temperature within the bag also enables better moisture and condensation control, as relative humidity falls as temperature rises. The result is to choose the right material for the insulating foam material and exterior material such as oxford, vinyl, or nylon fabric.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The purpose of a keep warm food delivery bag is to keep the food warm until it is ready to eat by the customer. Food delivery is a rapidly rising industry, due to the convenience, it provides to customers and has also been consistently growing. To boost their customer base, several fast-food restaurants provide delivery services. This prototype is specifically designed for motorcycles. The most significant aspect in improving the heat retention efficiency of delivery bags is the various types of thermal insulation materials.

3.2 Process flow chart

A flowchart in Figure 3.1 shows a visual depiction of the steps. It is commonly used to depict the flow of processes since it sequentially shows stages.

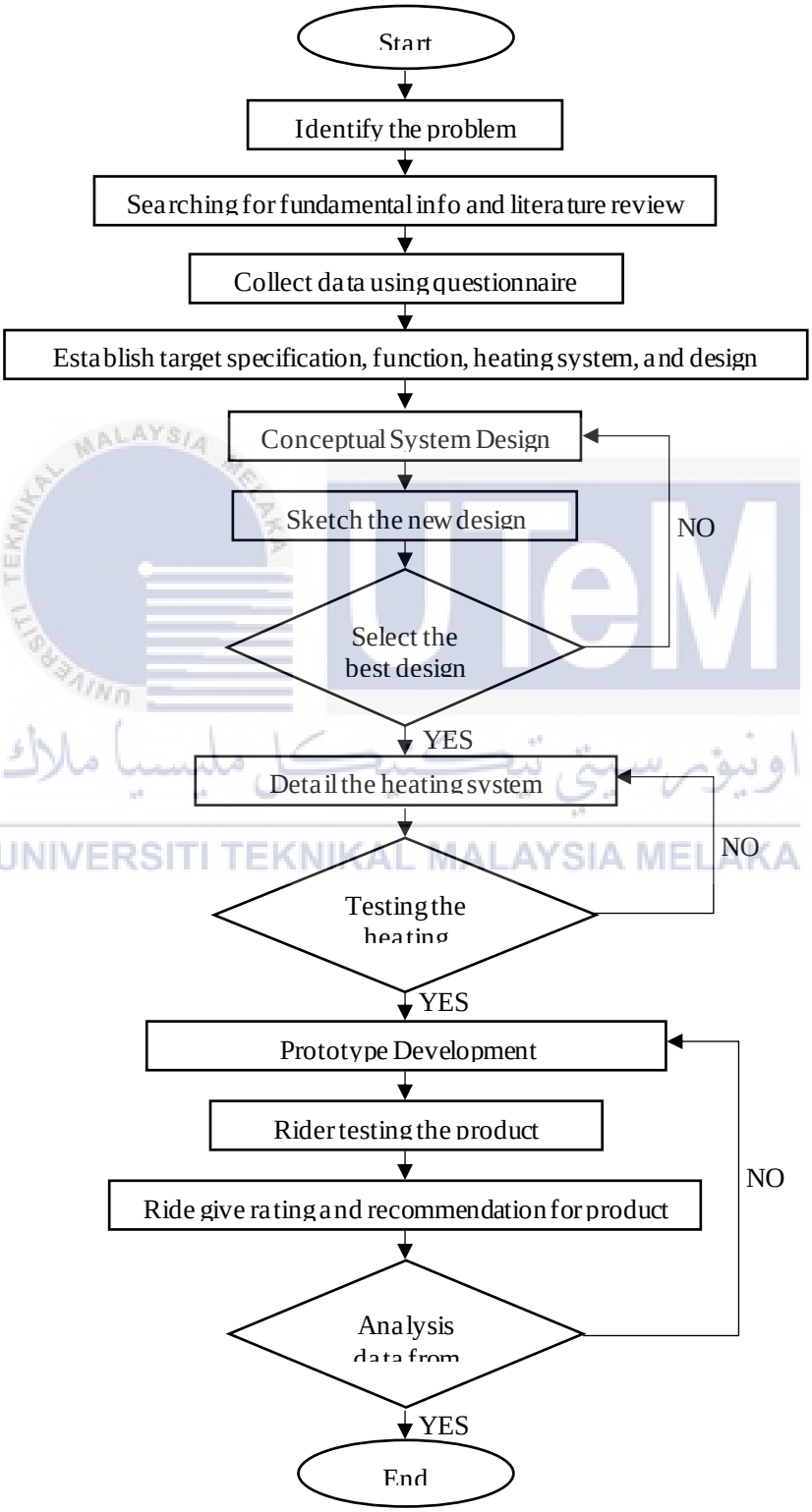


Figure 3.1: Process flow chart

3.3 Developing Questionnaire

The purpose of this questionnaire is to find the problem of insulation food delivery bags and the weakness of the existing bags. Data for these investigations were gathered randomly via social media which is Instagram, Facebook, Twitter, and WhatsApp posts. Questionnaires were created for the research detail problem for food delivery bags. This survey's questionnaire requests are necessary personal information being a rider and some questions about insulation bags. The last question asks about the weakness and the improvement that can be done. This questionnaire was answered by 38 riders from different companies and gender.

a) Gender

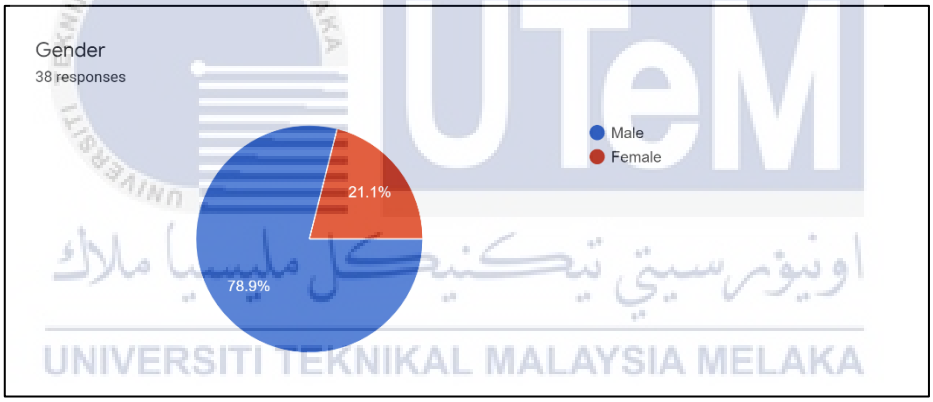


Figure 3.2: Percentage of gender.

b) Full-time or part-time

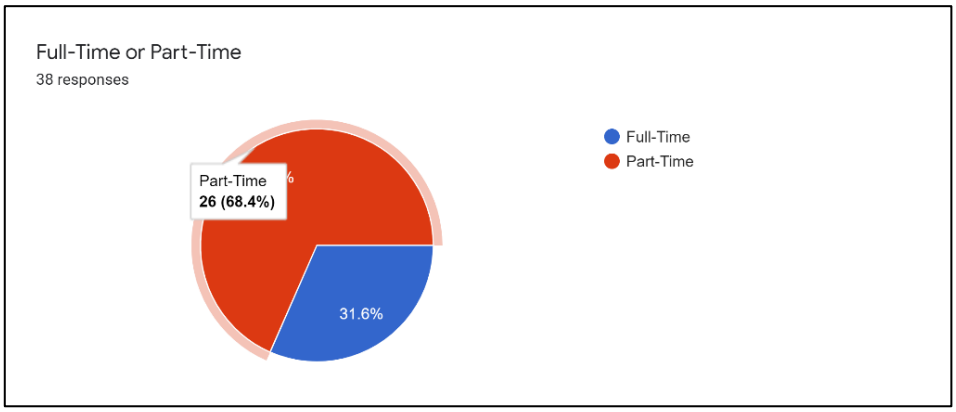


Figure 3.3: Percentage of full-time or part-time.

c) Which company did you register with?

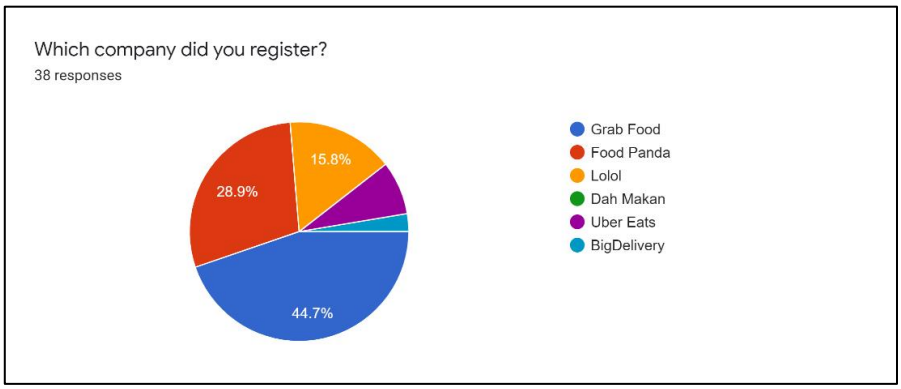


Figure 3.4: Percentage of the company that rider registered.

d) How long have been you running for a food delivery service?

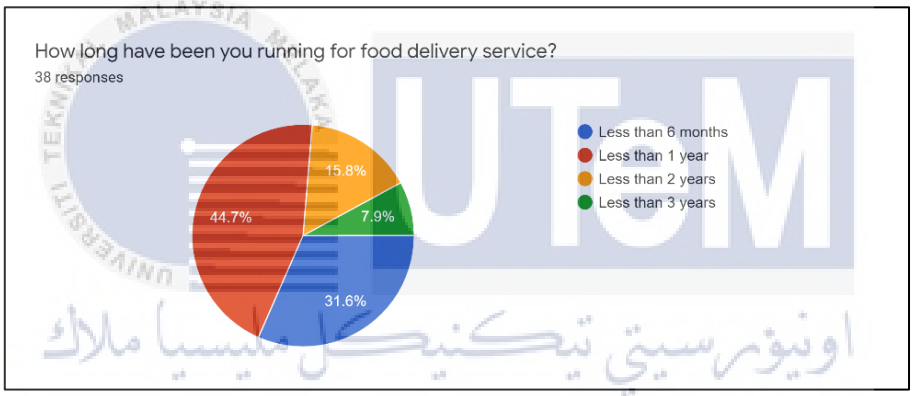


Figure 3.5: Percentage of a period of working time in the company.

e) What does the longest time estimate that you have sent to a customer?

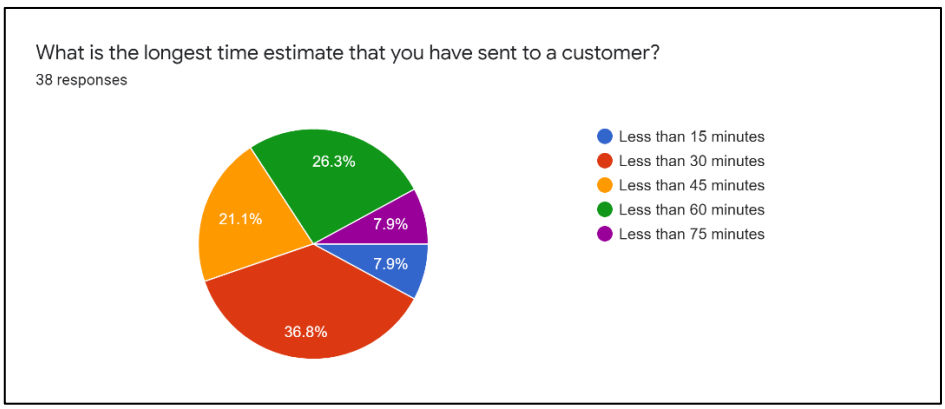


Figure 3.6: Percentage of estimate time for sending the food to the customer.

f) The suitable shape for a food delivery bag?

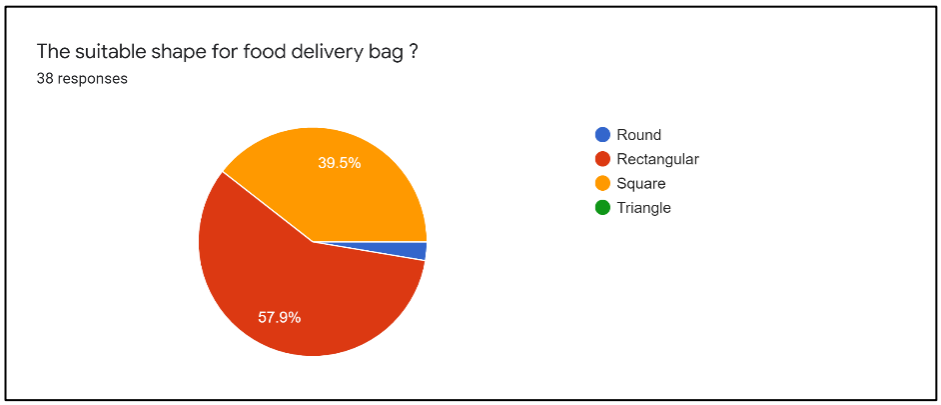


Figure 3.7: Percentage of the shape of food delivery bag.

g) How much partition is needed in food bag delivery?

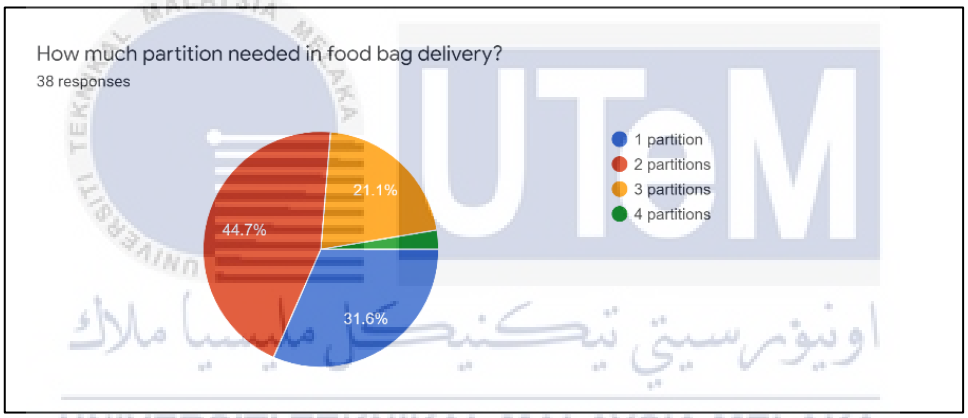


Figure 3.8: Percentage of the number of partitions required in the food delivery bag.

h) The suitable closure for food delivery bag?

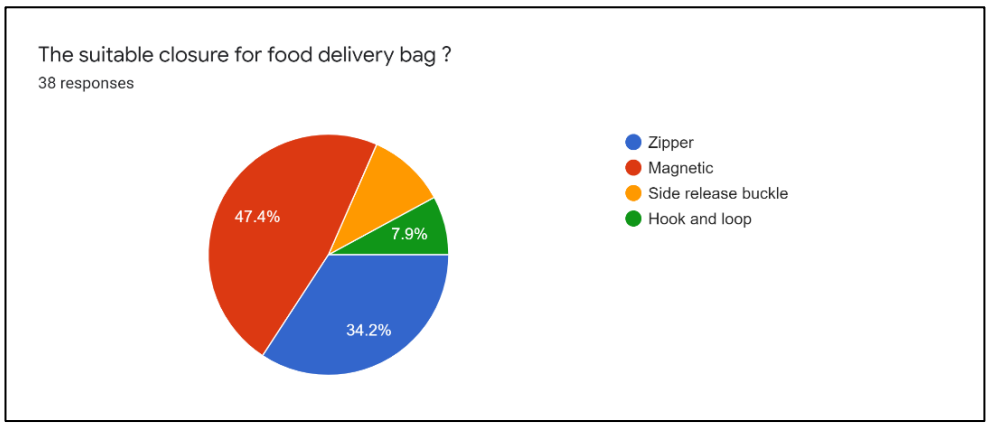


Figure 3.9: Percentage of the suitable closure for food delivery bag.

i) Is the food usually cold when it's delivered to the customer?

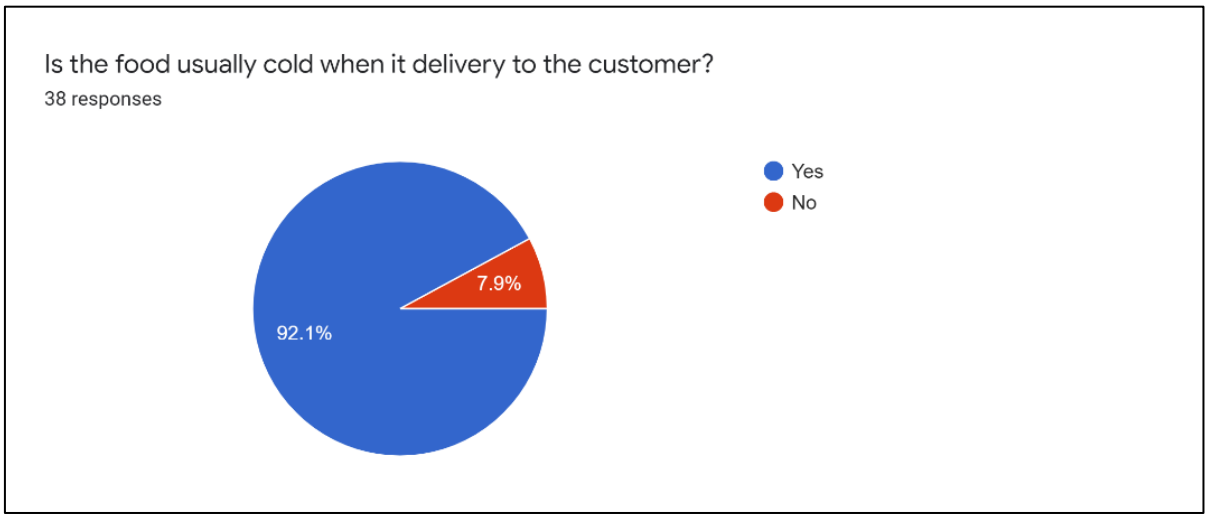


Figure 3.10: Percentage of the food cold or not when it arrives at customer's house.

j) Does the water always spill in the delivery bag?

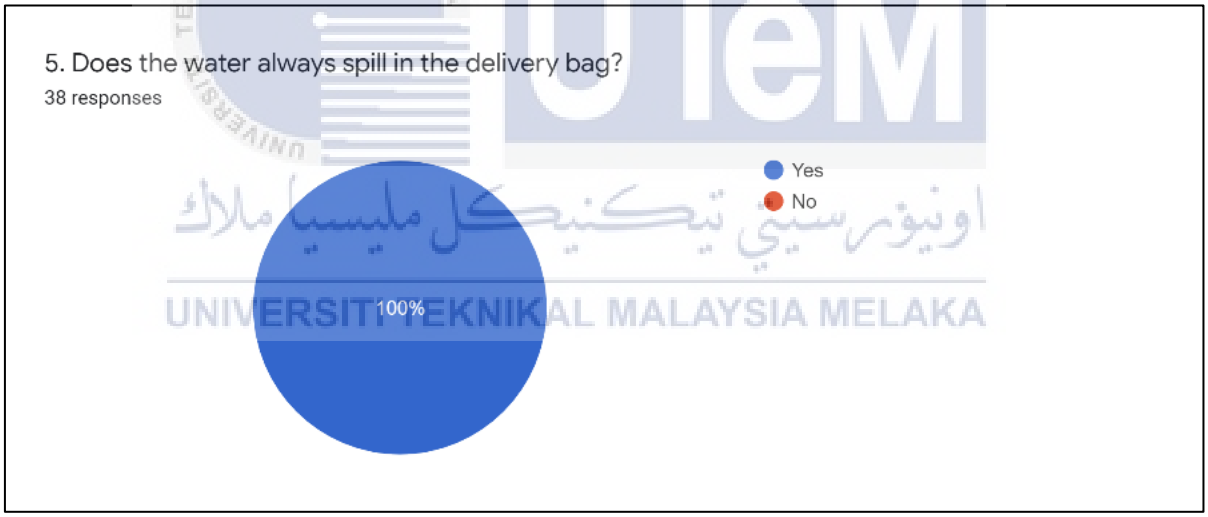


Figure 3.11: Percentage of water spilled in food delivery bag.

k) What is the weakness or limitation of bag delivery that you are carrying?

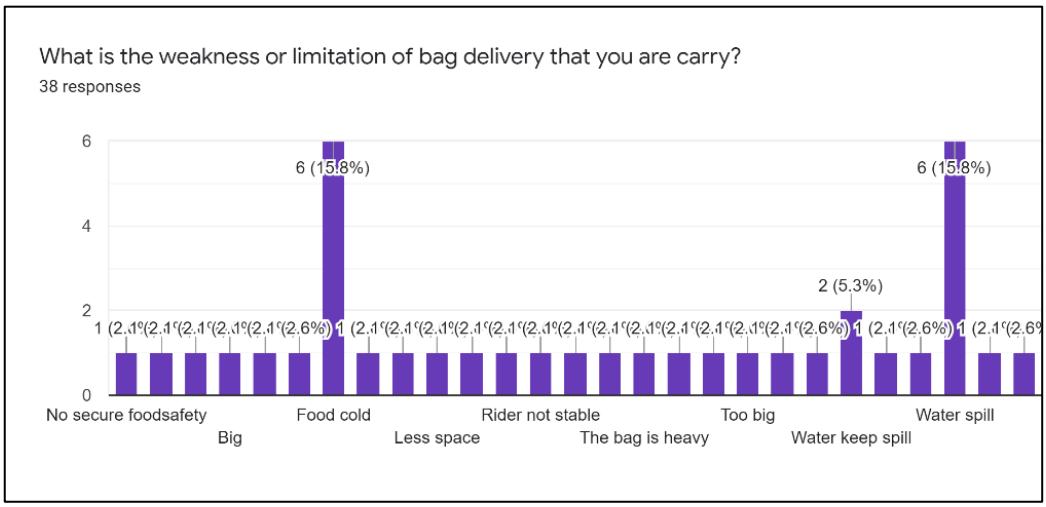


Figure 3.12: The weakness or limitation of existing food delivery bags.

l) In your opinion, what is the improvement for food bag delivery that you are using now?

Table 3.1: Improvement of food delivery bag.

No	Improvement
1.	Add stabilizer
2.	Add a stabilizer
3.	Make it lighter
4.	Maybe you can add a heater
5.	Make a stabilizer or anything that can stabilize the water
6.	More stable bag for food
7.	make it stable
8.	You can make a stabilizer to help the rider
9.	Make it medium size
10.	Perfect cup holder
11.	A fully sealed bag, lightweight, and easy to carry

No	Improvement
12.	Make an airflow for the smell to perish
13.	You can add a thing that can stable the cup
14.	Maybe have more partition
15.	Make it light
16.	Modified the bag to make food keep warm
17.	Bigger space
18.	More ergonomic
19.	Build a stabilizer to stable the bag
20.	put stabilized
21.	Build a bag that can stable the water from the spill
22.	Need a stabilizer
23.	Insert a heater
24.	Have a cup compartment that can prevent drinks from spilling
25.	Modified the bag that can warm the food
26.	You can add a stabilizer
27.	Add a heater
28.	Add a feature
29.	make it a little smaller
30.	Add a magnetic as a zipper
31.	Make it bigger
32.	Build a stabilizer
33.	Make a stabilizer, add a heater
34.	Make a thing that can food keep warm

3.4 Comparison between existing products

Three food delivery bags have been chosen to compare the design, material, and so on. Table 3.2 show the comparison of existing food delivery bag.

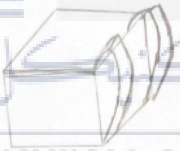
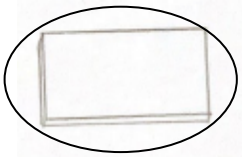
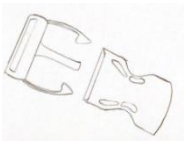
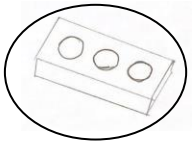
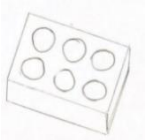
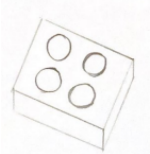
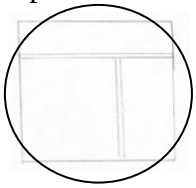
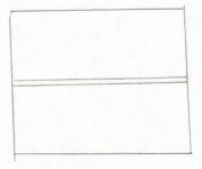
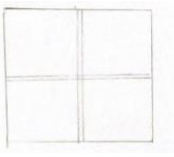
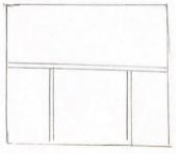
Table 3.2: The comparison of existing food delivery bag

	Grab Food	Food Panda	Uber Eats
Design			
Size bag	430 mm L x 430 mm W x 430 mm H	400 mm L x 400 mm W x 400 mm H	410 mm L x 400 mm W x 470 mm H
Exterior material	Polyester fabric	1680D PVC waterproof nylon oxford fabric	Polyester
Insulation material	Coated with polyurethane	Pearl cotton materials	Heat insulated pearl cotton materials
Weight	Not heavier than 10 KG.	3.1kg	3.1 kg
Heat level	31°C	31°C	31°C
Keep hold/cold	4 to 5 hours	4 to 5 hours	4 to 5 hours
Feature	Waterproof, insulated, thermal	Waterproof, insulated, thermal	Waterproof, insulated, thermal

3.5 Conceptual System Design

The morphological chart for this project is shown in Table 3.3. This project's concept design focuses on the design and material aspects of the project. The research and decision of this morphological chart were taken based on the questionnaire and literature review. As illustrated in the column, there are primarily four choices generated for each component, with four concepts engaged in the selection of ideas. Each topic is symbolized by a unique design or substance. This option is intended to be functional and to satisfy the project's objectives. Morphological charts are the most effective method for capturing the needed product function. This solution may be represented and shown using the chart.

Table 3.3: The morphological chart.

Morphological chart				
	Option 1	Option 2	Option 3	Option 4
Exterior shape	Round 	Square 	Rectangular 	Triangle 
Type of closure	Zipper 	Magnetic 	Hook and loop 	Side release buckle 
Hole of holder	3 holes 	6 holes 	4 holes 	8 holes 
Number of partitions	2 partitions 	1 partition 	4 partitions 	3 partitions 

3.6 Material of Keep Warm Food Delivery Bag

Types of thermal insulation materials are the most important factor in improving the thermal persistence performance of delivery bags. The fundamental feature of thermal insulation is its low thermal conductivity, which reduces the bag's heat rejection.

3.6.1 Exterior Insulated Material

For this product, oxford fabric and pearl cotton with aluminum foil are the ideal material for exterior insulation. Oxford fabric is wear-resistant, dirt-resistant, and easy to clean on the inside, oxford cloth is made with pearl cotton.

Oxford fabric was originally composed of pure cotton, but many of them are now produced with synthetic fibers such as polyester and rayon. It is a fabric that requires less maintenance than most other materials. When compared to most other textiles, it is easier to wash and retain its form. Oxford fabrics are quite economical because of the yarn used in weaving, and they are also very comfortable. Pearl cotton is completely colorfast. They may be cleaned regularly without fading. The thread may be cleaned at high temperatures of 95° C/203° F.

3M reflective tapes shall be added to the exterior of the prototype to help improve its visibility at night which indirectly increases the safety of the rider.

3.6.2 Type of foam insulation

Interior delivery bags, foam insulation keeps hot foods warmer for longer. With high insulation characteristics, it is placed inner lining of the bag and functions to minimize heat conduction (the transmission of heat through a solid). This product use polyurethane (PU) foam insulation and aluminum foil to cover the polyurethane (PU). Polyurethane (PU) foam insulation has many benefits such as resistance to water and moisturizing, keeping temperature, low thermal conductivity, and more. Polyurethane (PU) also provides

exceptional insulation and is widely available. In the middle of the bag, will be added a partition to separate part

3.7 Design of Keep Warm Food Delivery Bag

There is indeed a lot to talk about while creating a food delivery bag. Each design needs to be surveyed for each function used. Rider satisfaction is a major factor in designing a bag.

3.7.1 Size

Food delivery bags are available in a variety of forms and sizes to suit any requirement. The finest food delivery bags are designed to carry a variety of foods is 500 mm (L) x 380mm (W) x 380 mm (H) for exterior and 480 mm (L) x 360mm (W) x 360 mm (H) for the interior. It is standard for motorcycle because nowadays the majority of people who carry delivery bags is rider motorcycles and this product designed is specifically for motorcycle.

3.7.2 Type of closure

The function of the insulated food delivery bag is to ensure that foods maintain as much heat as remain or stay as cool as possible from the restaurant to the customer. Thus, the closure being of excellent quality is paramount. This product has two types of closure which are magnetic for the top of the bag and zipper for the front of the bag. To achieve this objective, the closure of the bag must be of high quality. Closures serve to secure food in place if little movement during transit and to keep the heat in the bag. They also offer rapid packing thanks to user-friendly designs.

3.7.3 Heavy stitching

Heavy stitching is used on most industrial bags to avoid rips and damage at the seams.

3.8 Equipment of Keep Warm Food Delivery Bag

Several equipment will be added at interior and exterior of food delivery bag. It is for improvement in bag innovation.

3.8.1 Waterproof pocket

Pockets provide additional storage space. Pockets will add to the inside bag to keep a power bank.

3.8.2 Supporting frame

For this food delivery bag, a supporting frame shall be added using a fiberglass rod. The supporting frame is very important because it makes the bag solid and undamaged. Bag delivery would be a shapeless fabric sack that would collapse over as you filled it fully if you did not have a frame. Furthermore, having a frame helps to maintain its shape.

3.8.3 Cup holder

Cup holders are designed in such a way that easy to use. The benefit of the cup holder is to be stable and makes the drink difficult to spill. Moreover, a cup holder can be used for multiple purposes and carry different kinds of liquids with this.

3.8.4 Ball bearing full extension slide

Placed in the drinks section, to make it easier for the rider to take the customer's drink.

3.8.5 Partition

Have two partitions for the inside food delivery bag. These partitions make inside bag delivery more stable since it fit the area and make it difficult for food to spill.

3.8.6 Corrugated board

At the bottom of the bag, the corrugated board is used to make the bag more stable and solid. The hollow board is a suitable material for delivery bags because it is lightweight and waterproof

3.8.7 Double side buckle clip adjustable

To tie the food delivery bag to the motorcycle, we use two straps on the bottom of the bag and the function is to keep the bag secure. Each strap has two buckle clips, one on the right side and one on the left side of the bag. The purpose is to make the bag more stable on the motorcycle by helping us to know the center for easy to tight the bag and can help the bag to be more balanced and difficult to tilt the bag.

3.8.8 Shoulder backpack strap

Used to carry a food delivery bag. Backpack straps are most important for user comfort. The material and kind of backpack strap are highly essential for the user's safety and comfort.

3.8.9 D-ring

Stitched on the right and left sides of the bag, to hang extra straps if the rider wants the bag to be tight with a motorcycle.

3.8.10 Electric heating pad

A heating pad is a pad that is used to heat the interior of the body bag to raise the temperature in the bag and keep the food hot.

3.8.11 Digital thermometer

A digital thermometer is used to determine and validate the temperature in the bag.

3.8.12 Power bank

The purpose of the power bank is to charge the current heating pad so that the bag keeps warm during the delivery of the food to the customer. The power bank is kept in a pocket on the inside of the bag.

3.9 Target Specification

To identify the overall of target specifications in this project, a study of the current prototype system and heating system was made. This study is very helpful for designing new systems and improvements

3.9.1 Sketch design

This is sketch design for exterior and interior prototype. This sketch also specifies a function on each part.

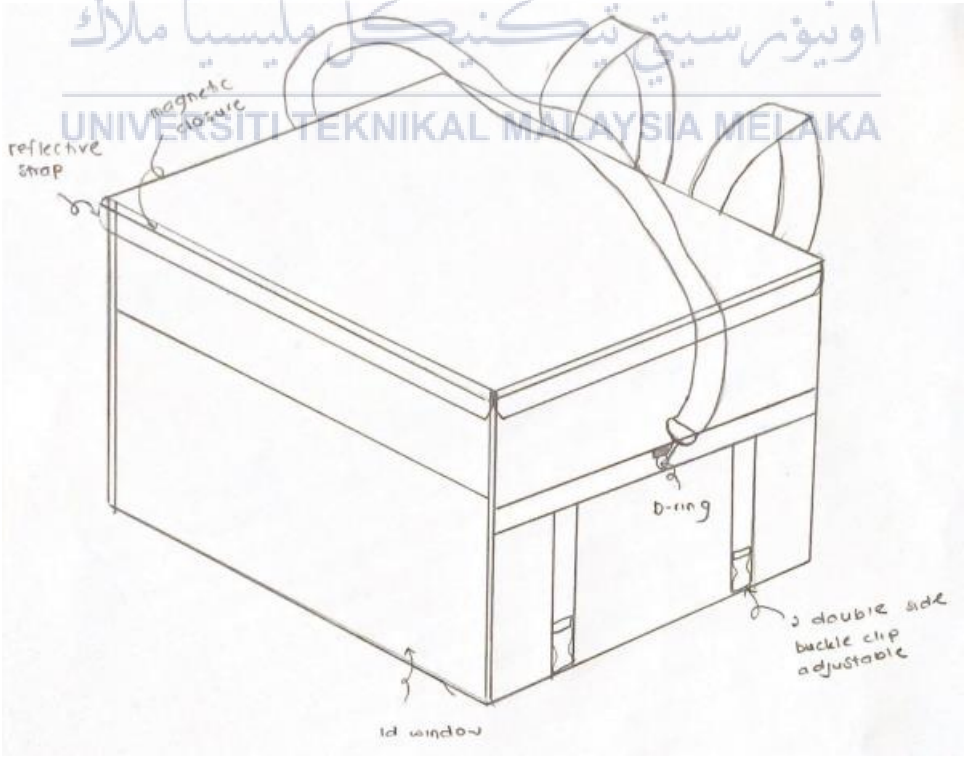


Figure 3.13: Target specification of exterior design

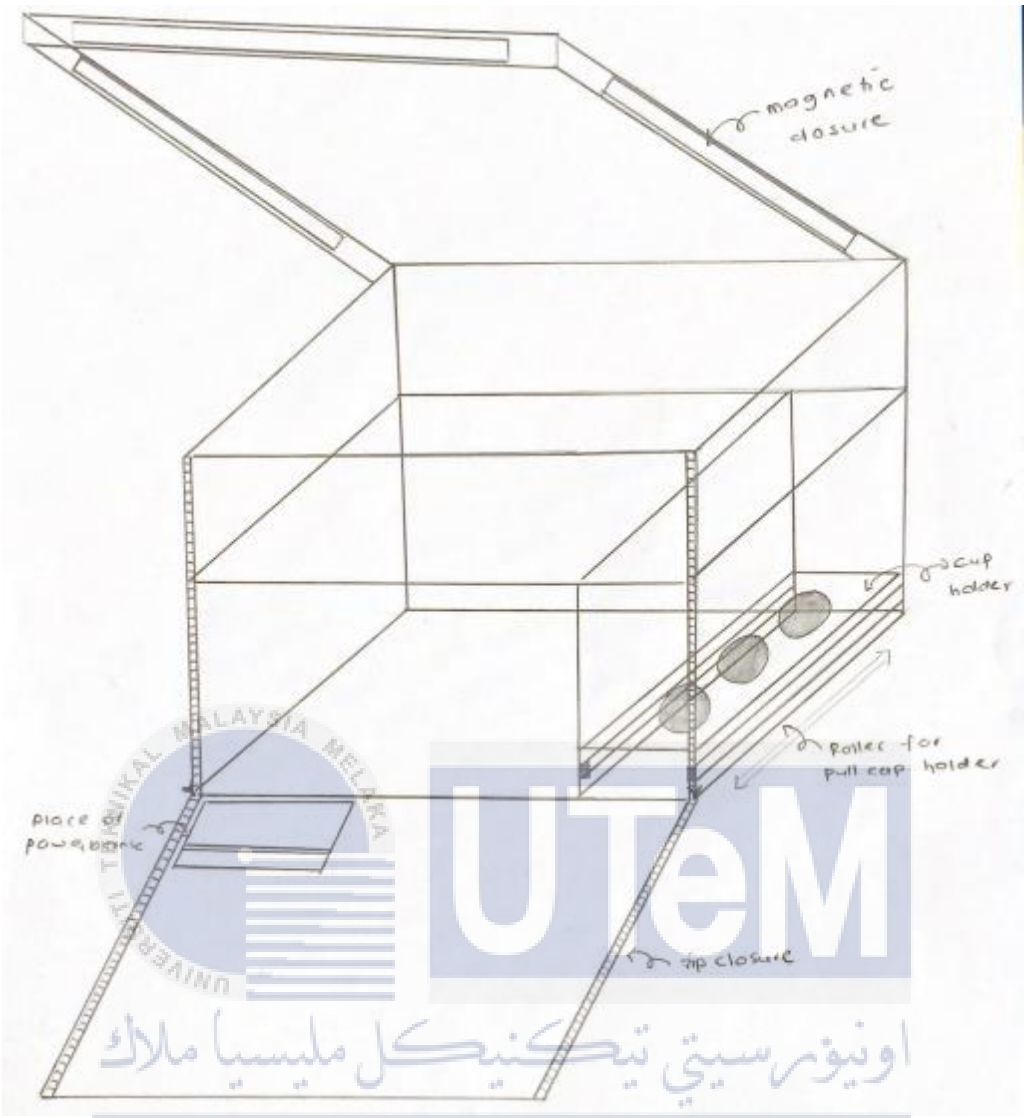


Figure 3.14: Target specification of interior design

3.9.2 Analysis of developed prototype

Nowadays, the demand for food delivery services is increasing. This is because after the spread of the Covid19 pandemic the government has decided to implement MCO. It causes people to not be able to leave the house and through this food delivery service increases. "Keep Warm" food delivery bag is initiated to help in the food and beverages industry and make it easier for the users. According to current data, the need for delivery bags is increasing. As more crowd-sourced food delivery applications develop, it is essential to deliver fresh food at the right temperature and humidity levels. Thermal insulators use

materials with low thermal conductivities to retain heat by slowing the rate of heat transmission from the bags inside to its outside surface. It uses conceptual system design to choose the ideal material and design, plus it is to develop a quality product for the user. This product is different from other bags because it has a cup holder with a roller which is to makes it easier for users to take customer drinks and prevent the drink from spilling. In addition, this product also has two double side buckle clips adjustable at the bottom of the bag, to make it strengthen with the motorcycle and stabilize the bag. Moreover, this product has a heating pad in the interior bag to keep the food warm which makes it different from others. Complete prototype development is expected at the end of this project.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter will be conducted in PSM 2 to discuss all experiment testing and a result that had been obtained throughout the prototyping and testing processes to create the Keep Warm Food Delivery Bag. Based on the literature review and rider questionnaires, through the design process and some modifications, the fabrication of the heating system for the Keep Warm Food Delivery Bag will be improved. The final design of the prototype was adjusted based on an earlier version of the concept design. A summary will be provided at the end of this chapter. Most of the actual findings had met the predicted findings, which were required to meet the project's objective.

4.2 Detail the design of the product

Final design Keep Warm Food Delivery Bag prototype is made using SolidWorks 2021 software. It shows the idea and concept of a bag cover that can be opened from the top and front of the bag. Figure 4.1 and Figure 4.2 shows a 3D rendering picture of the full prototype design.

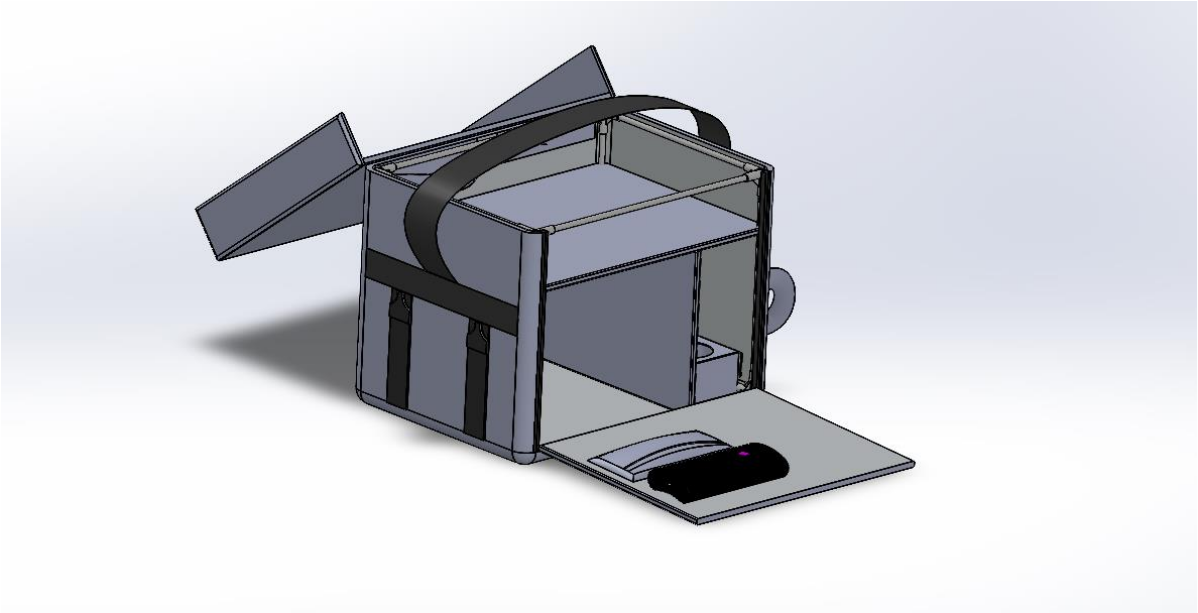


Figure 4.1: 3D SolidWorks

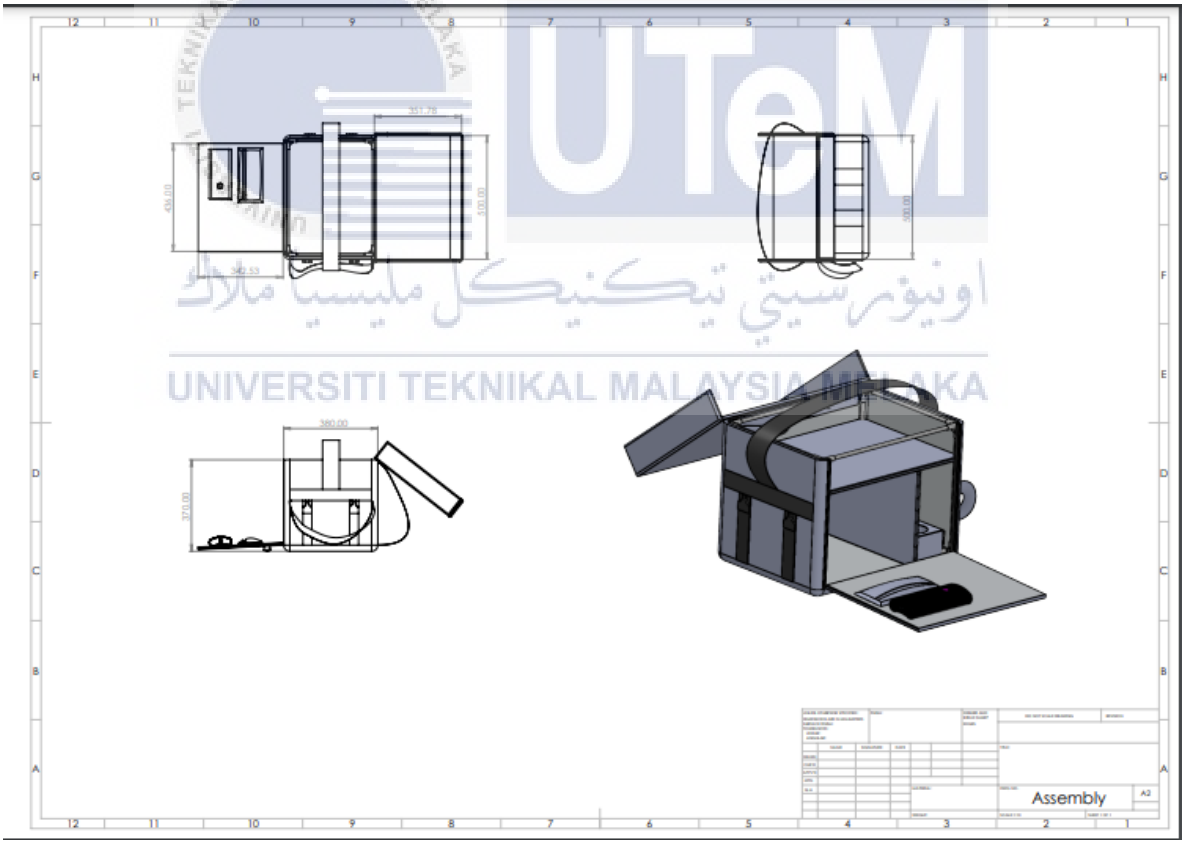


Figure 4.2: Detail drawing

4.3 Product fabrication

The fabrication process starts with involved sewing the bag and putting additional components such as a cup holder, partition, and pocket to put the power bank. All the parts and materials that have been sewed followed by the dimension on the drawing. This product has two partitions to separate into three sections. In this product, it uses a 3 cups holder with a roller which is it easy for the rider to take off the drink for a customer. This product also uses a heating element in the interior of this product to keep warm the food and have fresh and hot food for sending to customers. For the heating elements, it is using a power bank to charge the heating pad so that the heating pad can keep warm for a long time. The interior of this product has a waterproof pocket to put the power bank. The digital thermometer is placed in front of the exterior bag, and it is used to measure the temperature in the product using the wire.

Cooked food should not be stored at room temperature for more than two hours. Cooked meals that have been stored between 5°C and 60°C for more than four hours should be thrown (Grab Malaysia, 2020).

After all the fabrication processes are finished, the product goes through the testing process. This product has been tested by six riders; this phase is to make sure that the produced product follows the product requirement. Riders give the rating by questionnaire rating after testing the product. If any problem occurs during the testing process, the product must undergo the previous phase based on the process flow chart.

Figure 4.3: Exterior of prototype

Figure 4.4: Interior of prototype

4.4 Testing data temperature

A structured rating submitted was prepared, which included questions related to the quality of the food which is whether the food is usually cold when it's delivered to the customer or not. The data in Figure 3.11 shows 92.1% respond to yes which is the food always cold when it arrives at customer.

Online food delivery services are mainly determined by two factors: food quality and delivery services. The quality of the food and the delivery service goes in hand (Chandrasekhar, Gupta and Nanda, 2019).

For this product, system heating has been added to the prototype's interior to enhance heating so that the food keeps warm and ensures customers are satisfied with the quality of the food. The graph in Figure 4.3 and Figure 4.4 shows two of the analytical data that were taken based on the time required every 10 minutes to measure the temperature of the food delivery bag. This system charge using a power bank, the power bank battery runs out in roughly 4 hours and 40 minutes. The analysis is carried out till the power bank's battery dies.

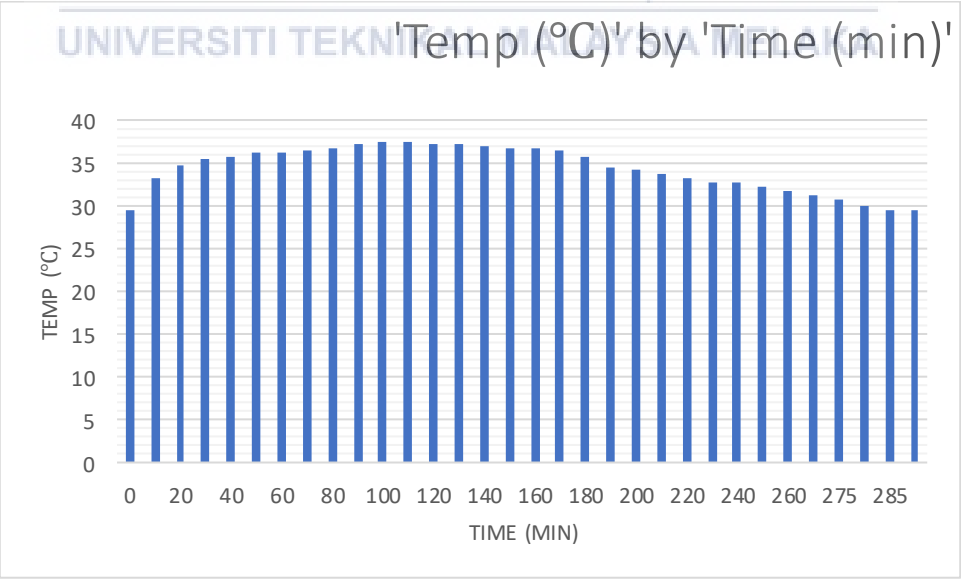


Figure 4.5: Analysis data 1 (Temperature vs Time taken)

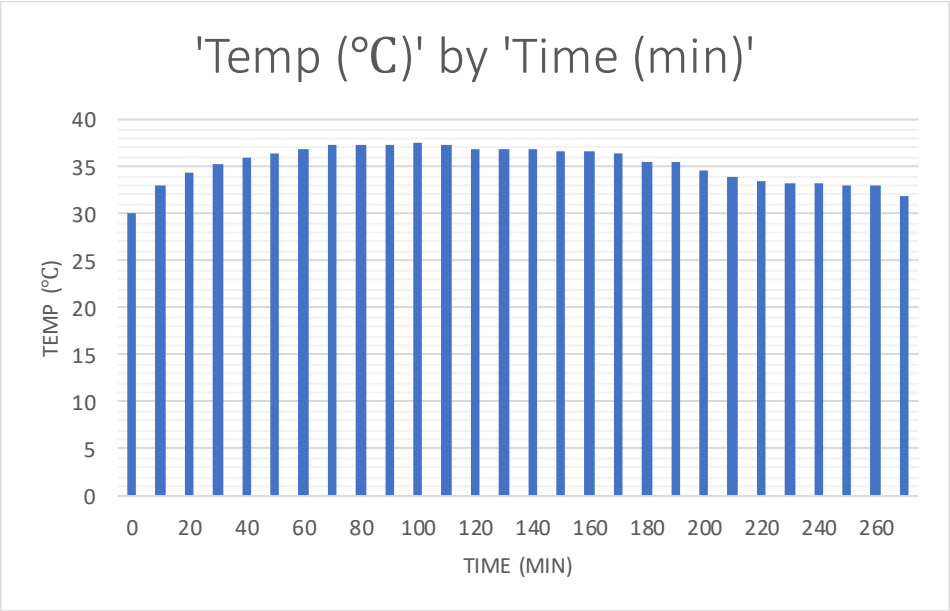


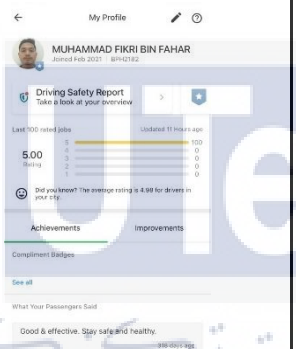
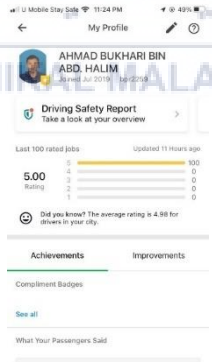
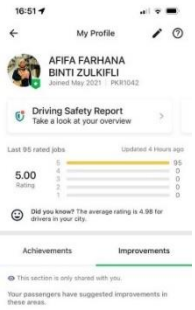
Figure 4.6: Analysis data 2 (Temperature vs Time taken)

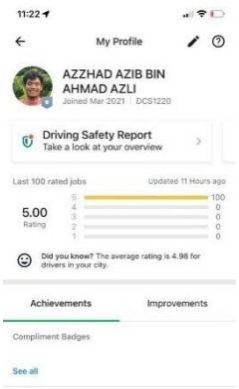
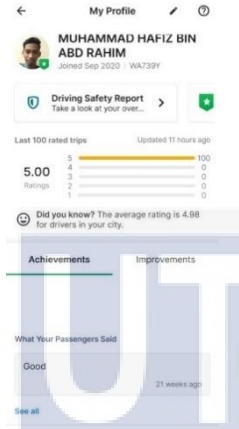
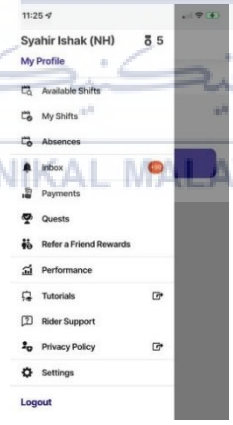
Based on analysis data 1, the highest temperature is 37.4°C at 100minutes and 110minutes while the highest temperature in data analysis 2 is 37.5°C at 100 minutes. The delivery radius varies for each delivery service and restaurant, but eateries usually stay within a five-mile radius. This varies depending on the area and availability of eateries. Certain locations require higher radiuses due to restaurant density, but others require radiuses of less than five miles. According to the findings of a consumer perception study, offering high-quality service to customers and creating superior customer value can contribute to customer satisfaction (Hu, Kandampully and Juwaheer, 2009). Thus, the rider can start charging the heating pad using a power bank if the rider wants to take the food to the restaurant to keep the food delivery bag warm for satisfaction customer to get food in warm.

4.5 Product testing

This product has been tested by six riders, one of them is a girl. Before this product is built, the same rider also answers the questionnaires that are given. The rider tests the bag to send the food to the customer. After the rider test the bag, the rider must answer the rating given to analyze and to know that it is the product fulfill the target of the objective's report. The rider is mostly from Grab Food and one of them is Food Panda's riders. Table 4.1 show the detail of the rider that test the product.

Table 4.1: The detail of the rider that tests the product.

No.	Name of rider	Profile rider	Picture
1.	Muhammad Fikri Bin Fahar		
2.	Ahmad Bukhari		
3.	Afifa Farhana Binti Zulkifli		

No.	Name of rider	Profile rider	Picture
4.	Azzhad Azib Bib Ahmad Azli		
5.	Hafiz Bin Rahim		
6.	Syahir Bin Ishak		

4.6 Experimental results

Keep Warm Food Delivery Bag is specially designed with insulating material to ensure that all food is delivered fresh, safe, and under the most optimal temperature conditions. The figure shows the data of analysis testing, the purpose of this analysis is to find out more details about the product, whether it is the same as the previous product or there is an improvement. Data for these ratings were gathered after the rider tested the prototype. This rating questionnaire requests a rating to indicate the extent to which you are satisfied or unsatisfied with this product. The last question asks about the overall rate of this product. This questionnaire was answered by 6 riders that have tested the prototype. In the innovative related question, the data showed a 100% rate was submitted by 6 riders. This means that this product reaches the target.

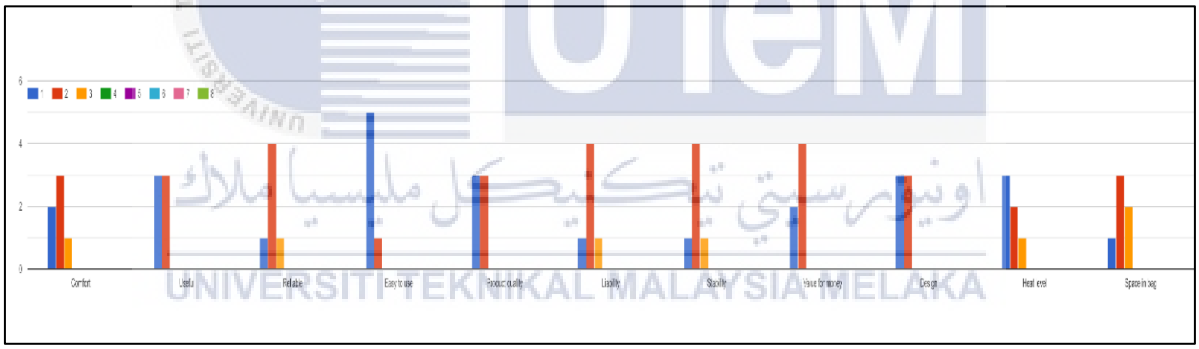


Figure 4.7: The data in the rating questionnaire

Table 4.2: The data in the rating questionnaire

Very satisfied		Satisfied		Unsatisfied		Very unsatisfied	
1	2	3	4	5	6	7	8

	1	2	3	4	5	6	7	8
Comfort	2	3	1	0	0	0	0	0
Useful	3	3	0	0	0	0	0	0
Reliable	1	4	1	0	0	0	0	0
Easy to use	5	1	0	0	0	0	0	0
Product quality	3	3	0	0	0	0	0	0
Liability	1	4	1	0	0	0	0	0
Stability	1	4	1	0	0	0	0	0
Value for money	2	4	0	0	0	0	0	0
Design	3	3	0	0	0	0	0	0
Heat level	3	2	1	0	0	0	0	0
Space in bag	1	3	2	0	0	0	0	0

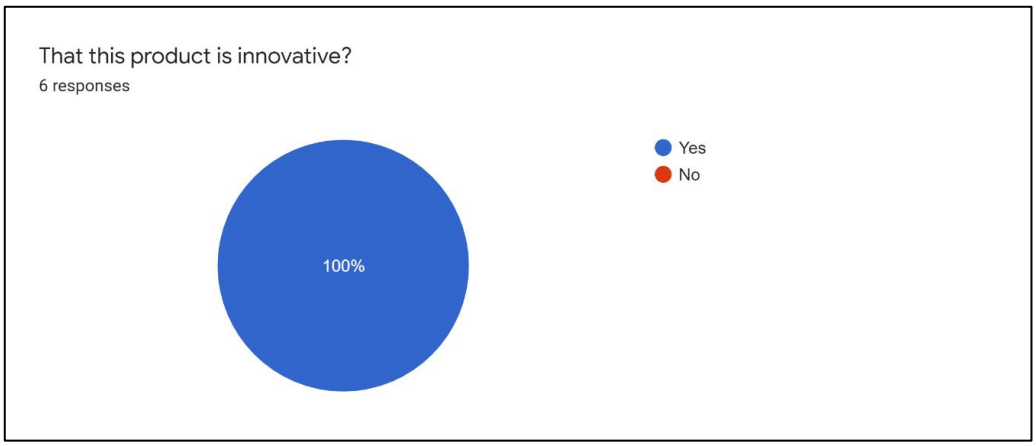


Figure 4.8: Percentage of innovation product

Table 4.3: The opinion for Keep warm Food Delivery Bag

No	Name	Opinion of this product
1.	Muhammad Fikri Bin Fahar	Very innovative and useful
2.	Ahmad Bukhari	Very comfortable and easy to use
3.	Afifa Farhana Binti Zulkifli	Easy to take food and drink
4.	Azzhad Azib Bib Ahmad Azli	Innovative in the stability of drink
5.	Hafiz Bin Rahim	Beg is comfortable n easy to use
6.	Syahir Bin Ishak	The heat level was very nice

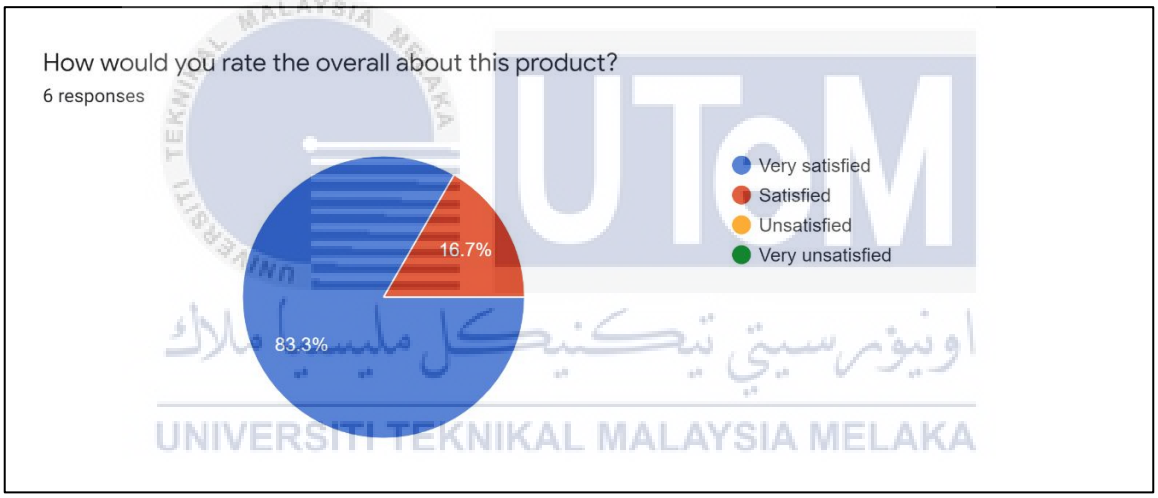


Figure 4.9: Percentage of the rating overall about this product

4.7 Project costing

The project costing is attached as shown in Table 4.4.

Table 4.4: Project costing for Keep Warm Food Delivery Bag

Item /Description	**Quantity**	**Unit price (RM)**	**Amount (RM)**
Waterproof food delivery bag	1	RM 71.50	RM 71.50
Cup holder (3 holes)	1	RM 12.50	RM 12.50
Magnetic closure W 4cm (2 meters)	1	RM 20.55	RM 20.55
Ball-bearing full extension slide	1	RM 9.20	RM 9.20
Power bank Pineng 20000mah	1	RM 48.50	RM 48.50
Waterproof pocket	1	RM 10.10	RM 10.10
Electric heating pad	1	RM 33.34	RM 33.34
Sewing bag	1	RM 68.00	RM 68.00
Digital thermometer	1	RM 8.89	RM 8.89
Corrugated board	1	RM 8.30	RM 8.30
Double side tape	1	RM 5.90	RM 5.90
Japanese cco	1.5	RM 5.20	RM 7.80
Shoulder strap	2	RM 7.50	RM 15.00
Sewing the pocket to the bag and punched holes	1	RM 95.00	RM 95.00
Total			RM 414.58

4.8 Summary

As a summary for this chapter, the most important thing for food ordering service customer satisfaction is the level of food quality. while the most important thing for riders is to simplify their work and stabilize the position of the water in the bag so that the water does not spill as well as maintain the warmth of the inside of the food delivery bag. The heating pads selected in this project worked well and functioned as expected as required by the project. The inside of the food delivery bag is always warm, and customers are also satisfied with their order. The design plan is good, but the heating pad has a natural drawback that the heating cannot control the temperature inside the bag. The highest heat level by using a heating pad can reach 37.2^{o}C and after the power bank runs out of battery, the heat reaches the same heat level as the existing bag due to insulation material.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In conclusion, at the end of this project, a prototype was created based on research from journals, websites and developing questionnaires to meet the goals and needs of users. Most food deliveries use motors as it saves time and reduces delivery costs as well as avoids road congestion. Hence, the focus of the Keep Warm Food Delivery Bag is created with a special design and system and by the motorcycle. The design of this bag is made by using conceptual system design by using information received and analyzed from questionnaires and journals. Shape and size play an important role in creating an insulation bag, this is because it is to ensures the safety and comfort of the rider. This prototype has been produced with suitable material and system and is designed for various types of food whether hot or cold. Data analysis found that the prototype can exceed the target objective, which is the appropriate level of heat for more than 4 hours by using a heating pad system. A suitable material is important because the needs to maintain the internal temperature of the food. Moreover, the chemical reaction also needs to consider preventing food poisoning. This prototype can achieve the objective in terms of adding a cup holder to the beverage section. It is very helpful and makes it easy for the rider to take a drink. It can also stabilize the position of water in the insulation bag and prevent water from spilling.

5.2 Recommendation

Several recommendations have been discovered during this study, which could guide future studies and research.

a) Put the wire on the interior of the bag, where it is placed between the exterior and insulation materials so that product will be more safe and secure.

b) Use a smaller power bank design than this prototype or use another electric source to make the beg more light.

c) Using a system where the temperature level in the bag can be adjusted.

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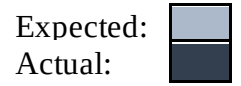
APPENDICES

APPENDIX A Gantt Chart PSM 1

NO.	PROJECT ACTIVITY	WEEK														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Project title	PSM 1 BRIEFING							MID-TERM BREAK							
2	Finalize the project title with the supervisor															
3	First meeting with supervisor															
4	Find and research journal															
5	Collect information and study about the project															
6	Second meeting with supervisor															
7	Plan the work process of the report															
8	Chapter 1: Introduction															
9	Problem statement, objective, and scope															
10	Third meeting with supervisor															
11	Chapter 2: Literature Review															
12	Identify the design															

13	Identify the material and	
14	Highlight the current issues	
15	Fourth meeting with supervisor	
16	Chapter 3: Methodology	
17	Process flow	
18	Target specification	
19	Report draft submission	
20	Fifth meeting with supervisor	
21	PSM 1 report submission	
22	Preparation of presentation	
23	Presentation PSM 1	



APPENDIX B Gantt Chart PSM 2

NO.	PROJECT ACTIVITY	WEEK														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	First meeting with supervisor	PSM 1 BRIEFING							MID-TERM BREAK							
2	Update report PSM 1															
3	Research about material product															
4	Research about design product															
5	Second meeting with supervisor															
6	Research about the system of product															
7	Third meeting with supervisor															
8	Design the product (SolidWork)															
9	Costing the product															
10	Fourth meeting with supervisor															
11	Prototype															
12	Temperature product analysis															
13	Experimental and the product															
14	Chapter 4: Result and Discussion															

15	Chapter 5: Conclusion and Recommendation															
16	Submission of PSM 2 first draft															
17	Submission of PSM 2 second draft															
18	Preparation and presentation PSM 2															

Expected:
Actual:

APPENDIX C Questionnaire survey for rider

SURVEY FOR RIDER DELIVERY FOOD

Dear Respondent,

I am a third-year student at Universiti Teknikal Malaysia Melaka (UTeM), and I am currently enrolled in Bachelor Project 1 at the Faculty of Mechanical and Manufacturing Engineering Technology (FTKMP). I would like to fill out a survey for the purpose of gathering data and analysing the results, as well as defining the scope of the project. This survey aims to find out what you thought about the "KEEP WARM" FOOD DELIVERY BAG.

"KEEP WARM" FOOD DELIVERY BAG is used by motorcyclists who serve as food delivery to customers. Orders are usually made either through a restaurant or retail website or mobile app, or through a food ordering company. "KEEP WARM" FOOD DELIVERY BAG can also be used for individuals and registered companies

Name *

Short answer text

Gender *

- Male
- Female

Full-Time or Part-Time *

- Full-Time
- Part-Time

Which company did you register? *

- Grab Food
- Food Panda
- Lolol
- Dah Makan
- Uber Eats
- Other...

How long have been you running for food delivery service? *

- Less than 6 months
- Less than 1 year
- Less than 2 years
- Less than 3 years
- Other...

What is the longest time estimate that you have sent to a customer? *

- Less than 15 minutes
- Less than 30 minutes
- Less than 45 minutes
- Less than 60 minutes
- Less than 75 minutes
- Other...

The suitable shape for food delivery bag ? *

- Round
- Rectangular
- Square
- Triangle
- Other...

How much partition needed in food bag delivery? *

- 1 partition
- 2 partitions
- 3 partitions
- 4 partitions
- Other...

The suitable closure for food delivery bag ? *

- Zipper
- Magnetic
- Side release buckle
- Hook and loop
- Other...

Is the food usually cold when it delivery to the customer? *

- Yes
- No

5. Does the water always spill in the delivery bag? *

- Yes
- No

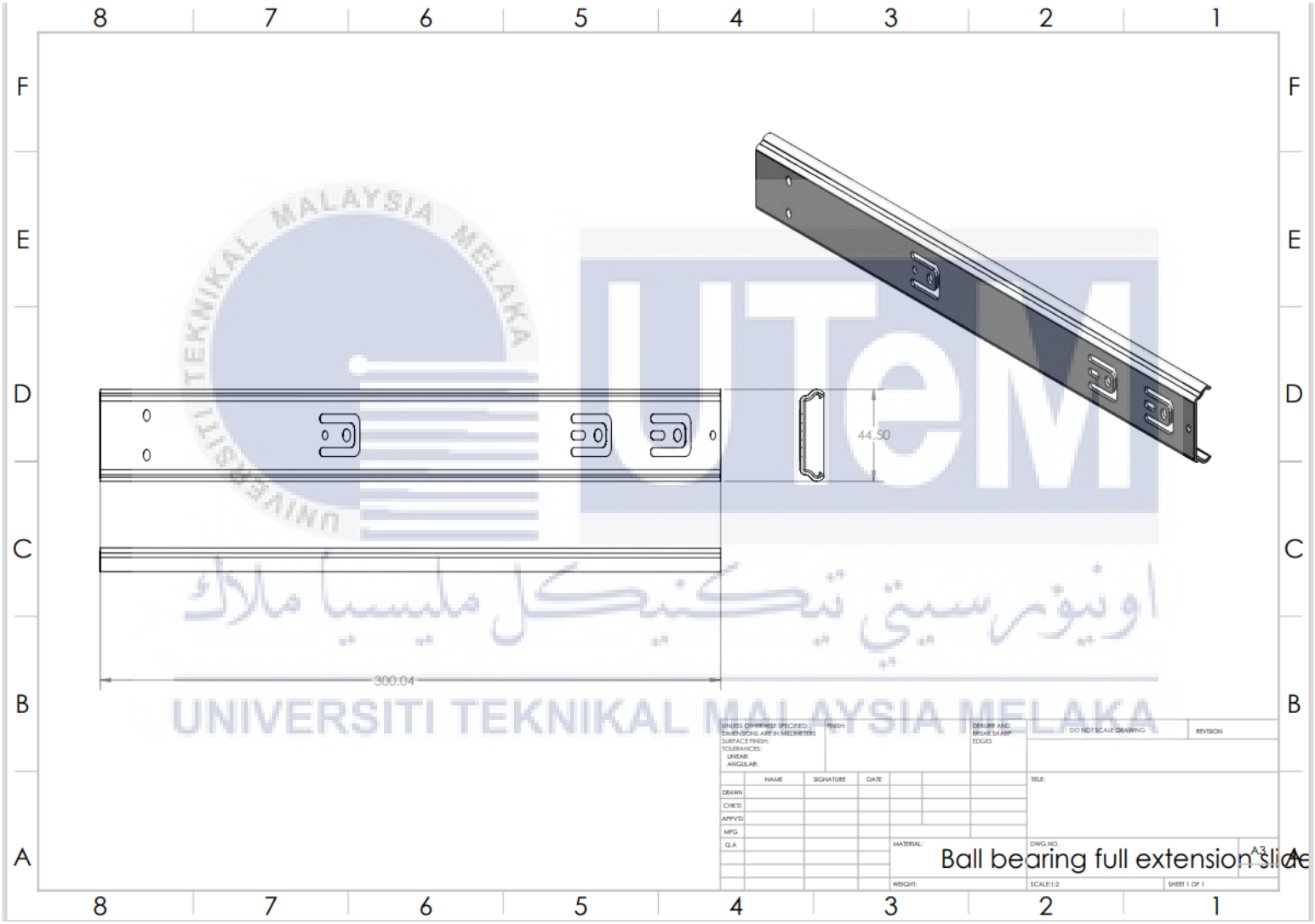
What is the weakness or limitation of bag delivery that you are carry? *

Short answer text

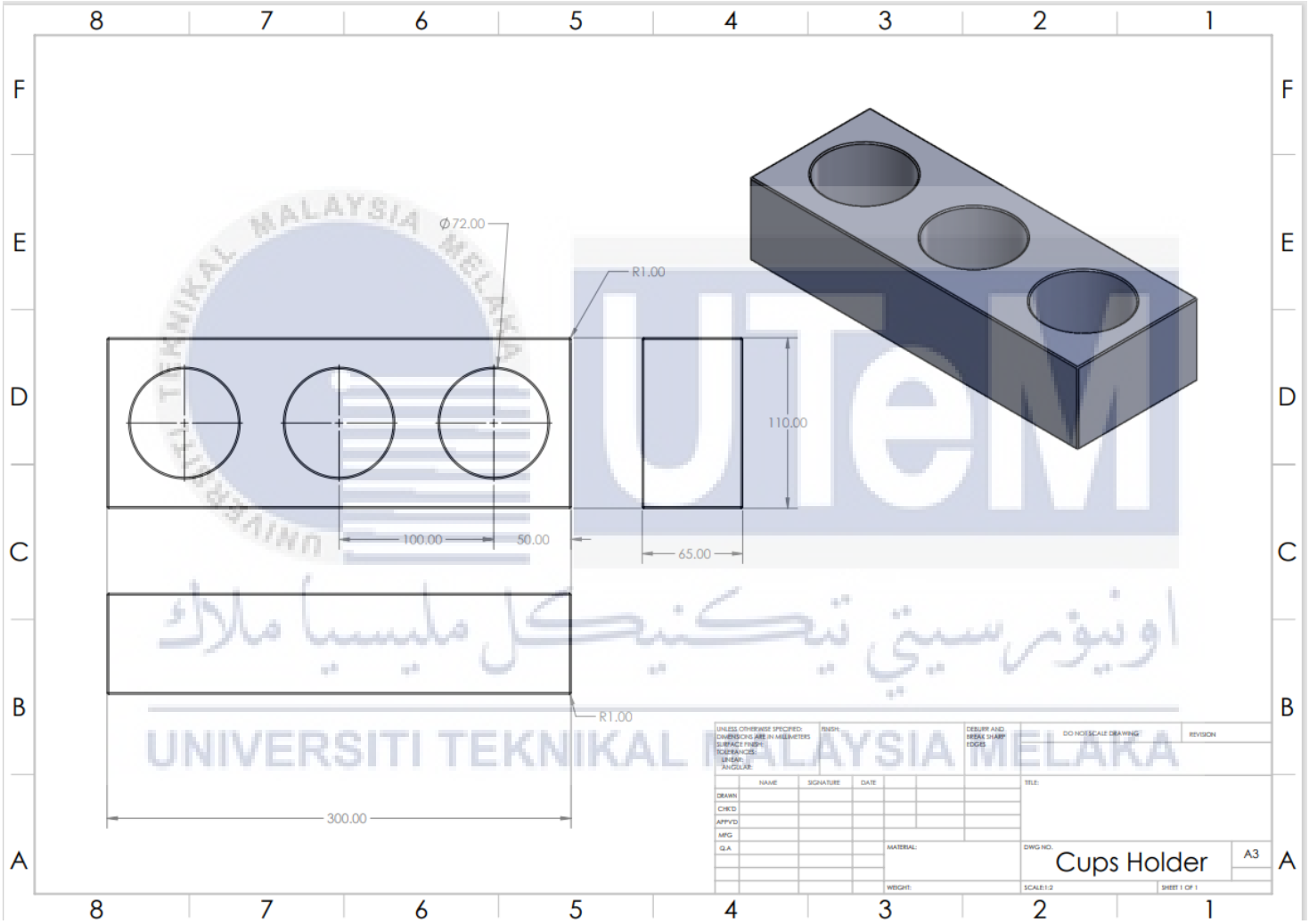
In your opinion, what is the improvement for food bag delivery that you are using now? *

Long answer text

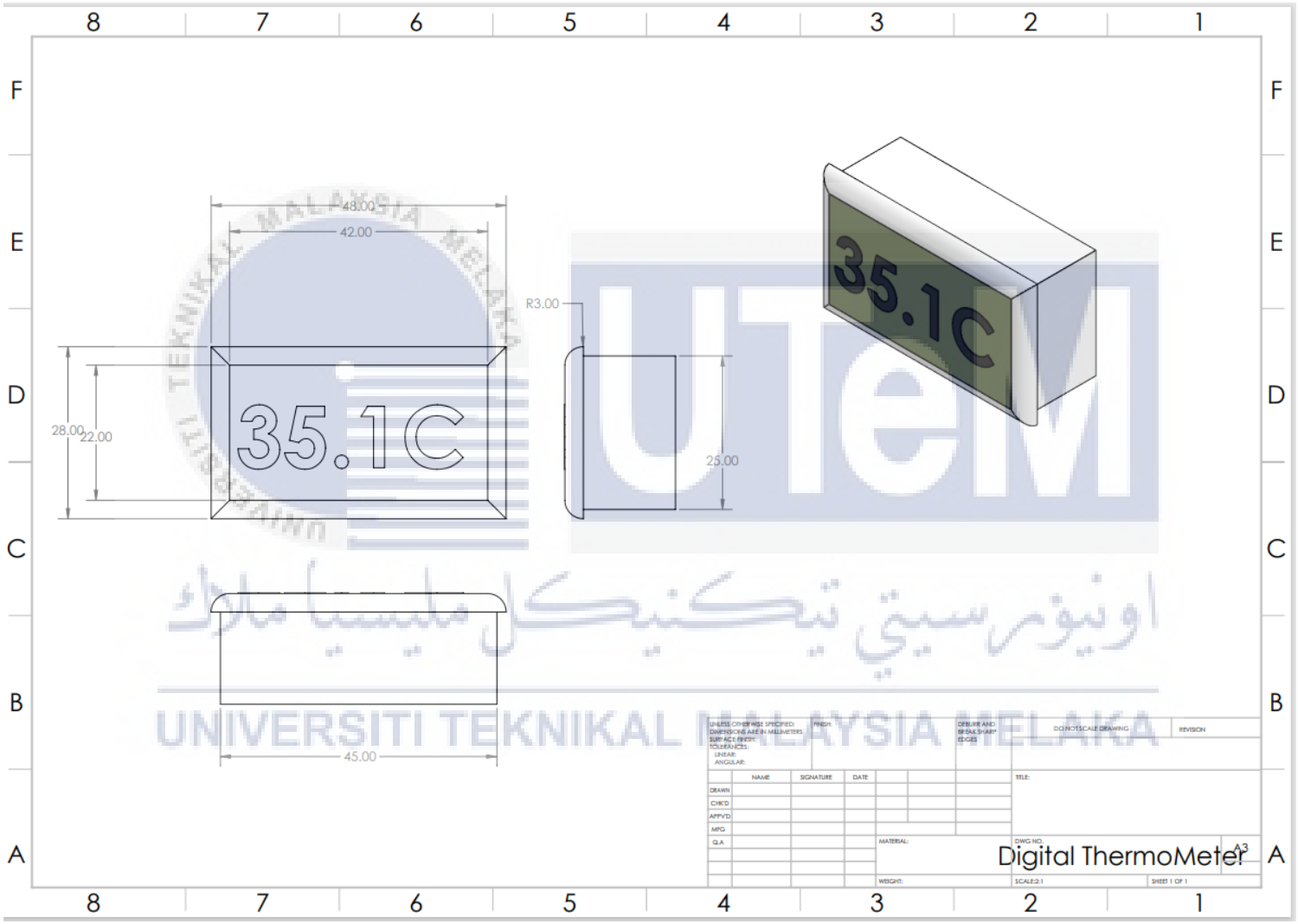
APPENDIX D Drawing of ball bearing full extension slide



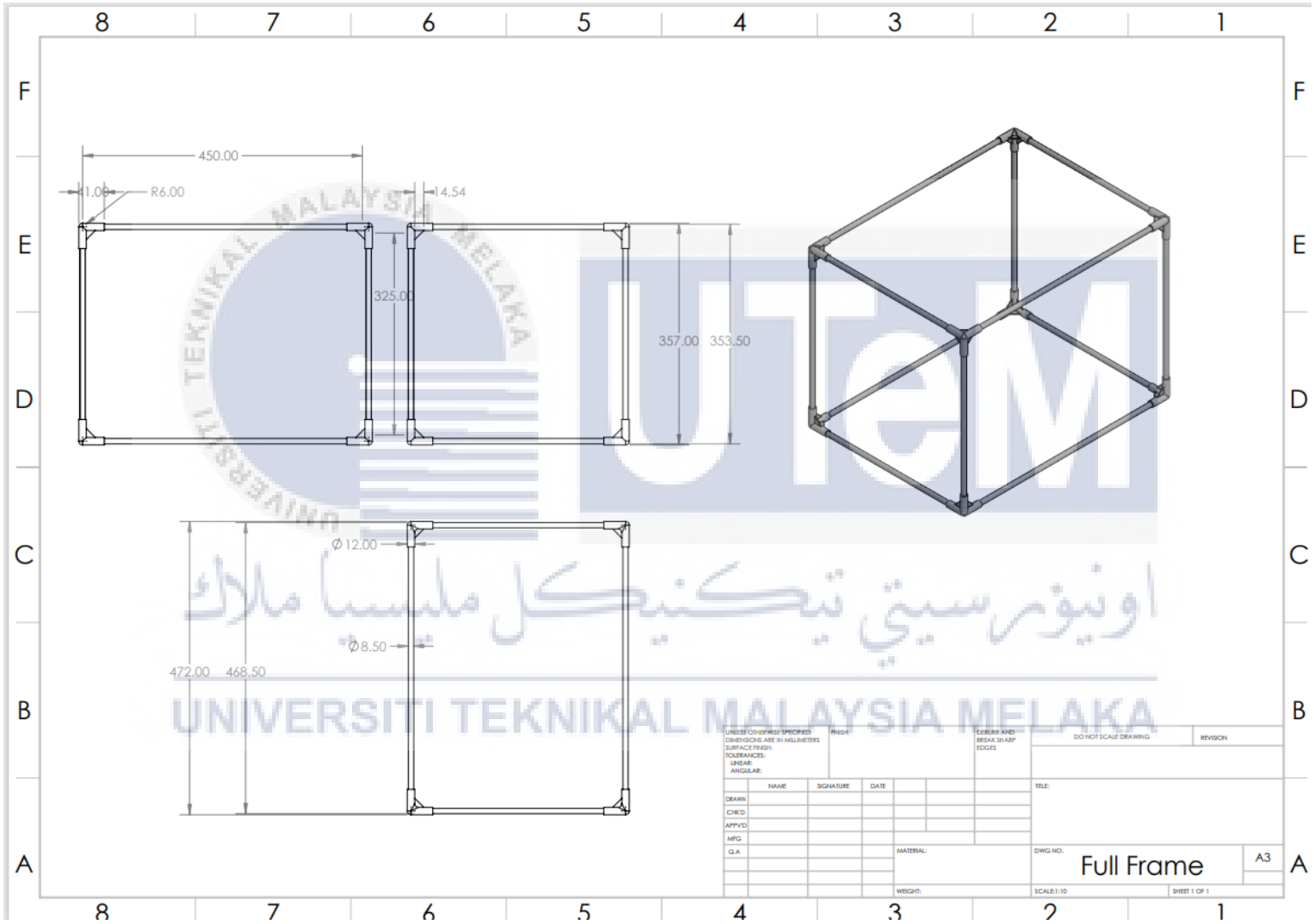
APPENDIX E Drawing of cup holder



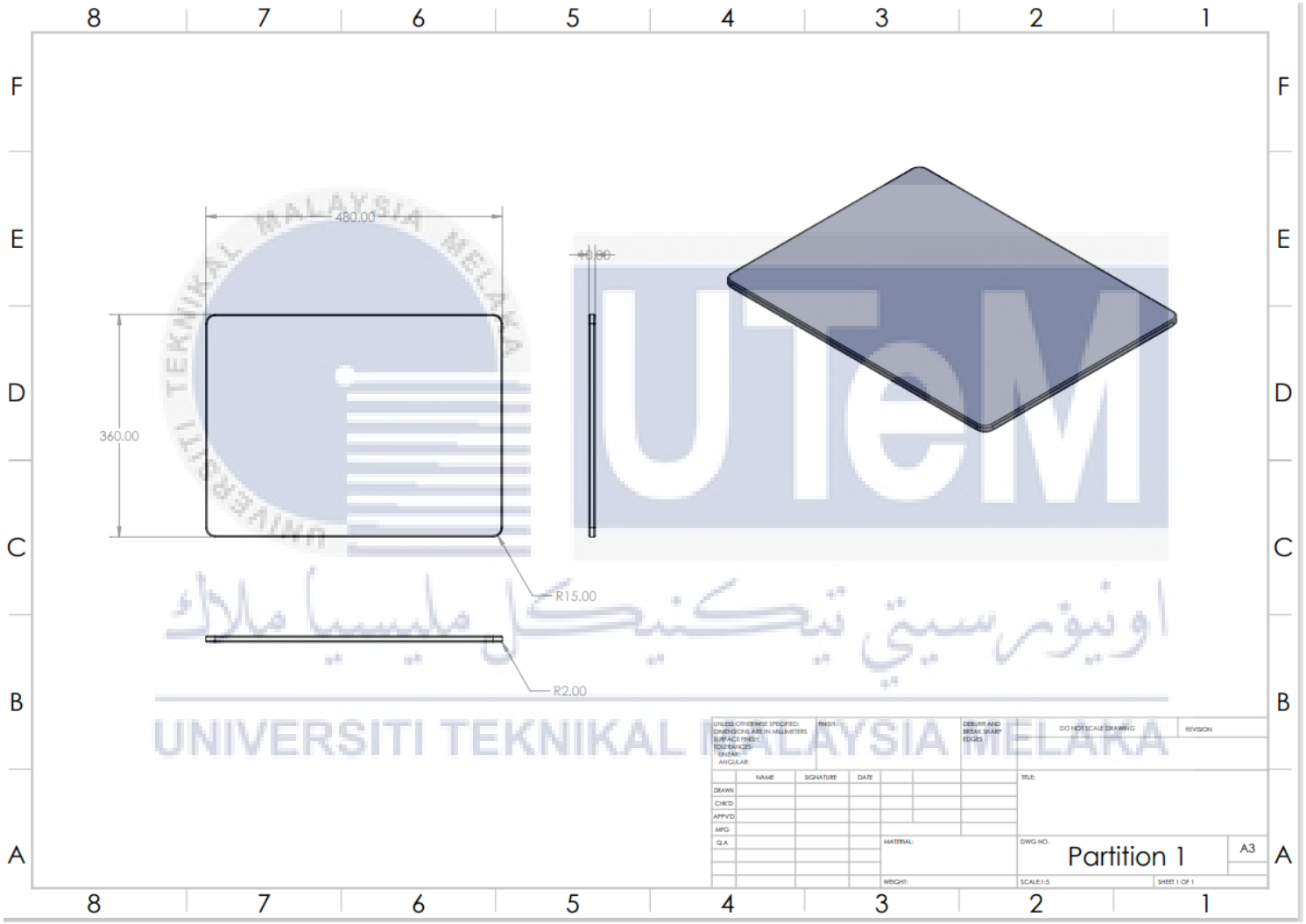
APPENDIX F Drawing of digital temperature



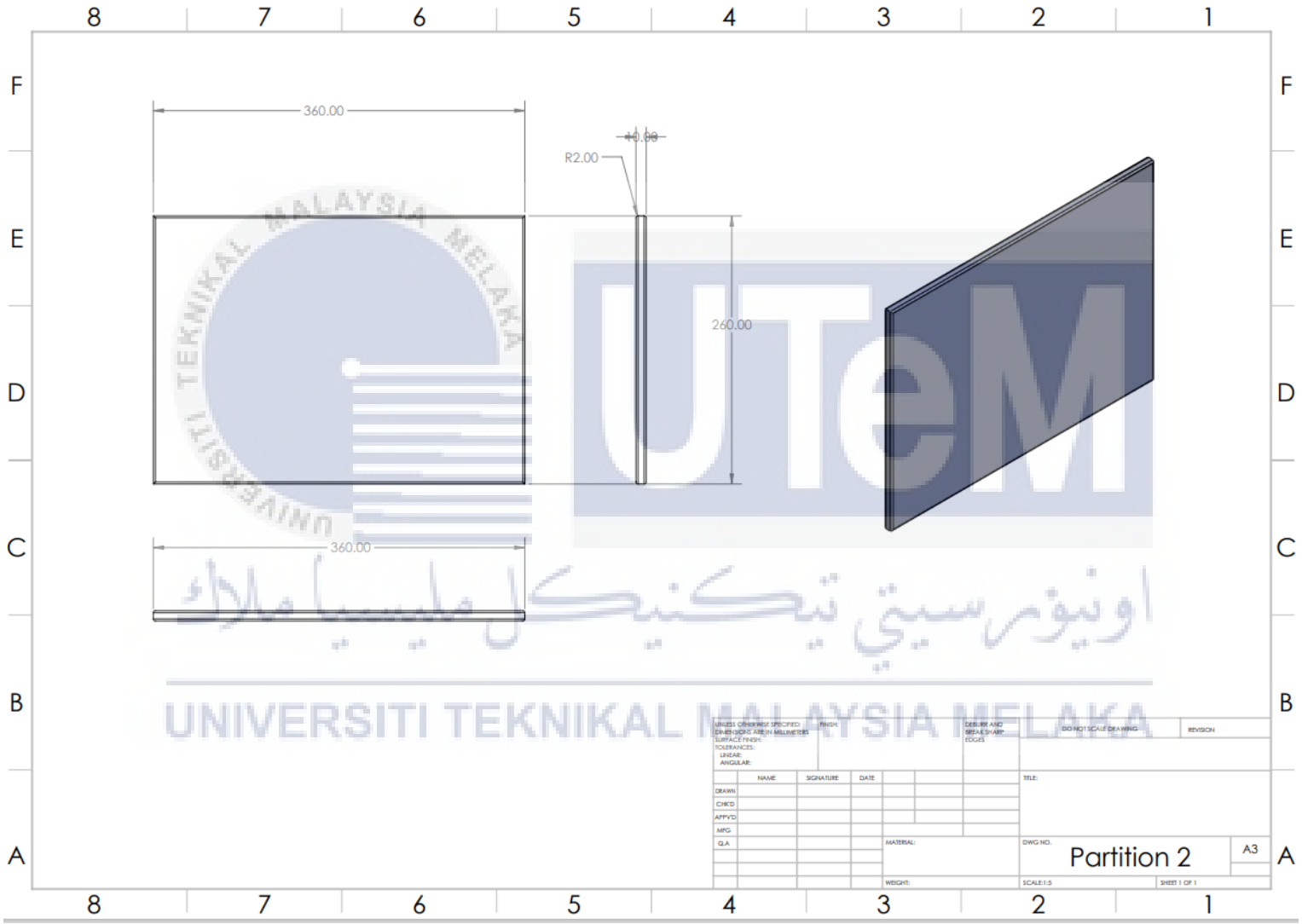
APPENDIX G Drawing of supporting frame



APPENDIX H Drawing of partition 1



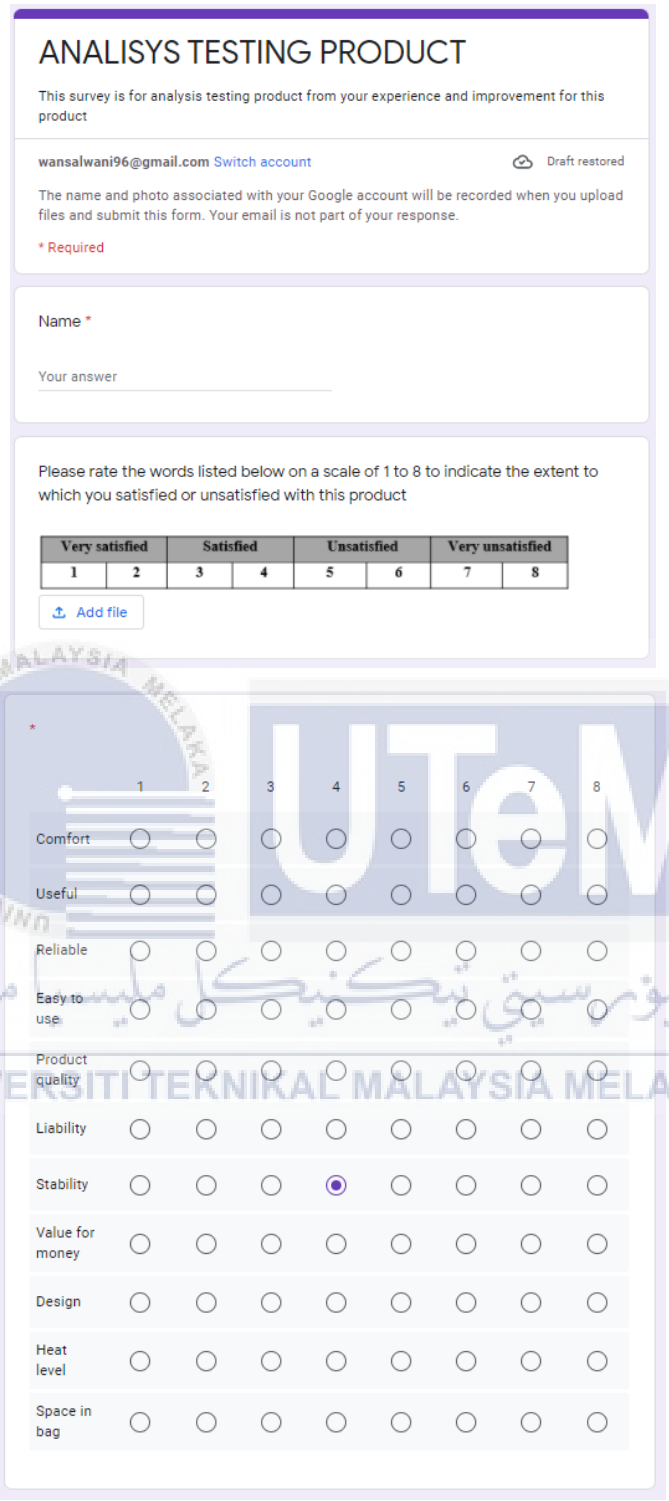
APPENDIX I Drawing of partition 2



APPENDIX J Drawing of power bank

APPENDIX K Drawing of waterproof pocket

APPENDIX L Questionnaire rating the product



ANALISYS TESTING PRODUCT

This survey is for analysis testing product from your experience and improvement for this product

wansalwani96@gmail.com Switch account Draft restored

The name and photo associated with your Google account will be recorded when you upload files and submit this form. Your email is not part of your response.

* Required

Name *

Your answer

Please rate the words listed below on a scale of 1 to 8 to indicate the extent to which you satisfied or unsatisfied with this product

Very satisfied		Satisfied		Unsatisfied		Very unsatisfied	
1	2	3	4	5	6	7	8

Add file

*

	1	2	3	4	5	6	7	8
Comfort	○	○	○	○	○	○	○	○
Useful	○	○	○	○	○	○	○	○
Reliable	○	○	○	○	○	○	○	○
Easy to use	○	○	○	○	○	○	○	○
Product quality	○	○	○	○	○	○	○	○
Liability	○	○	○	○	○	○	○	○
Stability	○	○	○	◉	○	○	○	○
Value for money	○	○	○	○	○	○	○	○
Design	○	○	○	○	○	○	○	○
Heat level	○	○	○	○	○	○	○	○
Space in bag	○	○	○	○	○	○	○	○

That this product is innovative? *

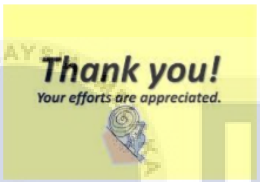
- Yes
- No

What is your opinion about this product ?

Your answer

How would you rate the overall about this product?

- Very satisfied
- Satisfied
- Unsatisfied
- Very unsatisfied



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SESI PENGAJIAN: **2020/21 Semester 1**

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