UNIVERSITI TEKNIKAL MALAYSIA MELAKA

GREEN CYCLING HELMET WITH ADJUSTABLE LIGHT "BE SAFE BE SEEN"

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology In Product Design (Hons)

by

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I hereby, declared this report entitled SMART CYCLING HELMET WITH ADJUSTABLE LIGHT is the results of my own research except as cited in references.

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APPROVAL DECLARATION

A report entitled “SMART CYCLING HELMET WITH ADJUSTABLE LIGHT" has been submitted, checked and certified as meeting the requirements and need Writing Project as specified.

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ABSTRACT

The Green Cycling Helmet is a new invention which strongly believed could give impact in current industry especially green technology. This main focus in this project is on the development of electronic circuit with electronic device such as voltage booster, solar panel, rechargeable battery, USB port device and electronic components. The casing was fabricated by using rapid prototyping machine. The illumination light let the rider clearly visible in the night time which from supported voltage from 12V to 30V. Super Flux LEDs 12V were used to increase the illumination distance which could be used for recreation purpose or cycling activity especially in night time. The functional prototype was fabricated based on the research, ideation and proposed mechanism. There were few analysis carried on in this project in order to validate the function of prototype to ensure the functionality of the solar panel. In the result, the USB Port Device and solar panel was received electric power source. The power from the sources is stored in the rechargeable battery. As the conclusion, the development of a prototype of Green Cycling Helmet is successful. In addition, research on the internet and thesis has been reviews relates on this project. The idea, objective, scope of study and problem statement is highlight to make the project is demand on the market.

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ABSTRAK

Green Cycling Helmet adalah ciptaan baru yang amat percaya dapat memberikan impak dalam industri semasa teknologi terutamanya hijau. Tumpuan utama dalam projek ini adalah kepada pembangunan litar elektronik dengan peranti elektronik seperti booster voltan, panel solar, bateri boleh dicas semula, peranti port USB dan komponen elektronik. Perumah utama dihasilkan menggunakan mesin pembentukan pantas. Pencahayaan membolehkan penunggang dapat dilihat dengan jelas di waktu malam yang disokong oleh kuasa voltan dari 12V hingga 30V. Super Flux LED 12V digunakan untuk meningkatkan jarak pencahayaan yang boleh digunakan untuk tujuan rekreasi atau aktiviti berbasikal terutama di waktu malam. Prototaip berfungsi berdasarkan kepada penyelidikan, penjanaan idea dan mekanisme yang dicadangkan. Terdapat beberapa analisis yang dijalankan dalam projek ini bagi mengesahkan fungsi prototaip untuk memastikan fungsi panel solar. Dalam keputusan itu, USB Peranti Port dan panel solar telah diterima sumber kuasa elektrik. Penjanaan kuasa daripada sumber-sumber yang disimpan di dalam bateri boleh dicas semula. Sebagai kesimpulan, pembangunan prototaip *Green Cycling Helmet* adalah berjaya. Di samping itu, penyelidikan di internet dan tesis telah ulasan berkaitan dalam projek ini. Idea, objektif, skop kajian dan permasalahan adalah kemuncak untuk membuat projek yang permintaan di pasaran.

TABLE OF CONTENT

LIST OF FIGURE

LIST OF TABLE

CHAPTER 1

INTRODUCTION

1.1 Introduction of a Project

In the present of era global competition through modernization and use of advanced technology is rapid growing. Correspondingly, this competition also leads to the impression that covers every corner of life aspects involving the upgrading of a country. For this reason, economic stability and development can make a life be more organized. In other words, the higher economy of country, the higher will be seen by other countries in different perspective. Thus, the creation and renewal is also an important skill that must be possessed by every individual, especially the designer to produce forms in accordance with the concept of a product. Generally speaking, the combination of technical skills and knowledge will produce a new creation and produce a profitable business opportunity.

Process, creation and developments of design are a methods used in solving problems that exists in everyday of life. So, the life can be more perfect pose. In the context of the process as well as design, technology is an important element in making project design. It will be more dynamic, creativity and efficient in

production. Scope designing is very important process in the production of a product. Normally, this process takes time. The process of designing is the process where rough ideas about a product which merged and formed an ergonomic and best products.

To meet the challenges in the design, this project is design and develops Green Cycling Helmet with Adjustable Light for cycling activity and recreation purposes. This helmet gain power rather than absorb solar energy by solar panels and electric power via USB. The power source is stored in the rechargeable battery. Therefore, Green Cycling Helmet with Adjustable Light is a new platform that will create from early stage of design until fabricates the prototype. For early design, there are few combination parts and components is attach into this project to accomplish the mechanism system on this project. In order to make sure this project is implemented in right way, there is more research on how this project can be made with successful in literature review and methodology.

In addition, Green Cycling Helmet with Adjustable Light is reflects to the full system integrated to the design which is hoping to assists the user to be seen at the night time with clear vision and the brightness of LEDs can lights up the dark area. Furthermore, the mechanism system consist white LEDs and red LEDs mounted on the front and rear helmet's which light up the front vision and rear attention. Besides that, the mechanism system required a solar powers panel, high intensity LEDs Light system, electronics components such as relay and switch. Equally important, the system will be created and to be adapted is a set of switch to turn ON or turn OFF. Apart from its usefulness, in the day time the helmet being worn as safety for user on the same time the solar powered battery can be recharged.

1.2 Scope of Study

Scope of this project covers on peoples in variety of age and gender. This project is categorized into two phases which is the functionality and the mechanism

of the system. For functionality, this project is make the cycler or user use it at the night time with clear vision and the brightness of LED can lights up the dark area. The rechargeable battery is gain the power (volt) from the energy by harvested solar panel and electric power. The solar panel is harvest the energy from the sunlight.

Other than that, electric power is gain through via USB. On the other hand, the mechanism that we used involves LED high intensity, rechargeable battery and electronic circuit system. The selection of material is also very important in fabricating the casing and the adjustable part.

1.3 Problem Statement and Objectives

The main concept of Green Cycling Helmet was to increase the level of community awareness towards their health by involving in doing recreational activities either in the day or night time. Indirectly, this method can help people care about their health and facilitates people during the activity. Since there were who are not really aware about the concept of green technology towards the top and health awareness in their health care. Therefore, the objectives of this project are as follow:

1. To design a complete functioning mechanism with system applying green concept such as solar pad for alternative energy.
2. To develop a complete prototype with integrated LEDs light front and rear of cycle helmet.
3. To validate the prototype by carrying out a few analyses such as battery reliability testing, battery charging, time observation illumination intensity testing.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

To generate a Green Cycling Helmet with Adjustable Light project, reading study was conducted to determine the type of materials to be used with appropriate restraint systems. Various aspects need to be considered in this study. Every aspect studied carefully to ensure the project runs smoothly. Additionally, this study can reduce the overall cost of expenses. For the most part, this study examined the technical and theoretical concepts that are related to mechanical and electronic technologies used in the present. Overall, this study is to facilitate the launch of the project during the manufacturing work plan schedule. Every study done must be adopted in accordance with predetermined specifications to ensure that the project is generated can be beneficial to consumers.

2.2 Definition of Bicycle Helmet

According from literature by Reeves and Christopher (August 06, 2014), bicycle helmets are designed to protect the head and while minimizing side effects such as irritation of peripheral vision. Under those circumstances, bicycle helmets should generally be lighter in weight and with adequate ventilation. Equally

important, helmet is a kind of safety helmets used by cyclists. The main goal of a helmet is to protect the cycler's head from bumps, although many helmets provide additional facilities. Furthermore, bicycle helmets are constructed from plastic, often comes with fabrics and foam on the inside for comfort and protection.

2.2.1 Types of Helmet

According from review journal by Liu BC, Ivers R, Norton R et al published in The Cochrane Library (2009), these are descriptions the popular types of bicycle helmet category. Table 1 shows the types of helmet and their description while Table 2 shows the types of usage.

Table 1 : Types of Helmet

Types	Description	Figure
Road Helmet	The original bike helmets were made for bicycling on roads and road racing. As they have evolved, they mostly had an elongated shape, always with vents, and are usually made with EPS foam covered by a thin plastic shell.	
Commuter	The term coined by Bell in 2004 when they introduced their Metro model. It has come to mean a helmet with a rounded shape, rather than the elongated road style. Has vents, and is usually made with EPS foam covered by a thin plastic shell. It sometimes has accessories such as mirrors, winter ear flaps and rear blinkers that are useful for commuting.	

Table 2 : Types of Usage

Types	Description
Youth	Usually a small or medium road or mountain helmet, designed for riders from about 10 to 15. Graphics usually reflect youthful themes. Has vents and is usually made with EPS foam covered by a thin plastic shell.
Child	It is focus on children between the ages of 5 and 10. Can be just a smaller youth model, resembling a road helmet, or can have a rounder shape like a toddler helmet. It is tested under the CPSC standard with exactly the same head form weight and drops as an adult helmet.

2.3 Case Study (Internet and Journal)

A case study is one of the research methods to review the previous history in order to get the idea, project concept development, project methods and so on. In other words, case study is one of the mechanisms for our references to grab and get more knowledge about some research or product or what else that has done by previous researcher. It viewed the scientific process and concept based on their experimental. Usually, it comes out like journal, books, article and so on. The component of case study is the actual research where they use the fact and logical concept that nobody can argue their research.

The case studies made via the internet and certain reference materials. However, the study is primarily made through the internet for a variety of information can be obtained without limits. Via the internet, reading and facts listed on the web site also helps get the problem statement. Internet is one of the studies carried out to obtain a variety of information quickly and easily. Through this medium, various theories can be attributed to this project.

2.3.1 Solar Power

Nowadays, there are a phenomenon discovered where a solar panel was generate an electricity using the photovoltaic effect. Stated from Solar Electricity Handbook 2012 Edition, Michael Boxwell, (2012), the phenomenon was found by a scientist who observed that certain materials produced an electric current when exposed to light. In addition, solar transfer the energy to electricity could be a wonderful concept where it can take power from the sun to generate power to electrical equipment.

According from review from internet (http://sciencelearn.org.nz) on title Science Stories Harnessing the Sun Photovoltaic, sunlight can be converted into useable electricity by using photovoltaic cells. 'Photo' means light and 'voltaic' means relating to electricity. In general, a solar cell is a device that converts the energy of sunlight directly into electricity or energy by the photovoltaic effect. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight. Assemblies of cells are used to make solar panels, solar modules, or photovoltaic arrays. Henceforth, photovoltaic is the field of technology and research related to the application of solar cells in producing electricity for practical use. The energy generated this way is an example of solar energy.

In engineering, dozens of solar cells that connected together it can make a larger energy can be generated by the solar panel. But, the efficiency of solar power system still poor compare to other sources. There are several factors that affect the efficiency of this system which is solar cell efficiency, intensity of source radiation and storage technique. The output power has to be maximized in order to increase the efficiency instead of the aesthetic value in design of solar panel. There are several ways to generate this energy but the best way is by using solar cells packaged in a PV module. PV modules are the basic element of each PV system that is consists of many jointly connected solar cells. Figure 1 shows the complete mechanism system is solar powered.