

PRODUCT CONCEPT OF RECHARGEABLE BATTERY FOR ENVIRONMENTALLY FRIENDLY TOWARD ELECTRONIC COMMUNICATIONS EQUIPMENT TO FACILITATE THE USER

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ABSTRACT

Communication technology is growing rapidly this time, has encouraged the development of technology gadgets. This also led to the emergence of advances in hardware and are offset by technological advancement and sophistication along with the hardware. Directly or indirectly, communication technology has become an important part of many areas of life. Because many conveniences offered today's communications technology, communication technology can hardly be separated from the various aspects of human life. Because of today's communications technology has become one of dependence on human life today as a tool of communication technologies that exist today. With the technology of today's communications technology like gadgets. Gadget is one tool that is always used, or used to perform daily activities. Where all the gadgets that we often use in communicating, interacting with someone we need. Because of this gadget is one of the most practical tool that easily under anywhere. And this gadget is also a tool that we use in our day to day activities. But of all the gadgets that we use often need to optimize the energy or power gadgets power, even it takes to recharge the battery also needs to take hours to recharge the battery. Even when we do any activities inside the house or outside the house. Therefore we are very important to recharge gadgets.

Keywords: Rechargeable, Gadget, Wrist Charger.

1. INTRODUCTION

1.1. Background

Communication is a very basic thing in human life. And even has become a phenomenon for the formation of a society or community terintegrasi by information on each individual in the community to share information to achieve a common goal. In a simple communication can occur if there are similarities between the delivery of the message and the person receiving the message. In line with this is that the communication (communication) is derived from the Latin word "communis". Communis or in the English language "commun" which means the same. When we communicate means that we are in a state of trying to pose similarity (Suardi, 1963:13).

Communication is a process in which a person or a few people, groups, organizations, and communities to create and use information in order to connect with the environment and other people (Syaiful, 2009:8).

Communication is a process of delivering information (messages, ideas,

ideas) from one party to another. In general, communication is done verbally or verbally that can be understood by both parties. if no verbal language that can be understood by both, communication can still be done using body movements, shows a certain attitude, such as smiling, shaking his head, shrugging. This way is called nonverbal communication.

Speaking of communication, there is no sense of right or wrong, should be seen from the definition of emergence to explain the phenomenon that is defined and evaluated. Communication is sometimes too narrow, as communication is a process of interaction. The process of communication interaction can also be done directly and indirectly, direct communication is done by communicating directly or communicate with face to face, whereas indirect communication is done by communicating over the phone and send letters. Where in this day and age when communication can be done anywhere and at any time because there is currently a sophisticated communication tool we can do bekomunikasi

through some of the tools of high-tech electronic communication.

According to the times when the communication is very important, because the communication is included in the suit human needs. Because without communicating it feels empty and silent. Therefore humans currently can not be kept out of the means of communication. Because communication is not familiar with the place and time to do the communication. Communication can also be done with online media, the online media of communication had not become a stranger today.

2. THEORETICAL BACKGROUND

2.1 Gadget Theory

Surely you do not often hear the word gadget, but do you know what a gadget is? The following definition of the gadget is small technological (such as a device or a device) a term derived from English but is often regarded as a novelty to refer to a device or instrument that has a specific purpose and a useful practical function that is generally given to something new. Understanding the gadget is actually very broad. Every heard the word gadget what comes to mind are the various kinds of electronic goods that looks very practical. One of the things that distinguishes the gadget with other electronic devices is the element of "novelty", that is to say from day to day gadget always comes up with the latest technology that makes the present human life becomes more practical. Gadgets are designed differently and are considered more advanced than the normal technology available at the time of its creation .

Gadgets in a general sense be regarded as an electronic device that has a special function on each device. Have you ever wondered why such a thing is in great demand by many people nowadays? The answer is because along with the advancement of technology today's world is growing very rapidly, perhaps even when we're sleep the world of technology continues to make its development to meet the needs of modern man's technological and practical. And maybe some things that are called by this gadget there is in our hands as laptops, netbooks, tablet PC, mobilephone, smartphone, gaming console, and others. Of

various brands of gadgets very much Indonesian market, so that we can follow the development of the technology is increasingly growing very rapidly once.

Gadgets in a general sense be regarded as an electronic device that has a special function on each device.

2.2 Gadget History

Charger now is not foreign to our ears goods. Charger is the first thing in searching by user cell phone or mobile (cell), when the electricity in the mobile phone battery has run out. The battery requires charging a battery charger for mobile phone in order to get back to work optimally.

Charger is actually under consideration since the 1800s due to the presence of rechargeable batteries to support a tool - an electronic device that is easy to carry anywhere. The presence of rechargeable batteries is derived from a French physicist Gaston Plante named. Gaston Plante lead acid battery cell discovered in 1859. From this discovery made it back to find a tool that can make finding the battery is re -powered.

Gaston discovery plante in later refined by Waldemar Junger, an engineer from Sweden. In 1899 he succeeded in creating a battery nicke; - cadmium. After perfecting his find, he marketed it in 1906. Since this is the charger and rechargeable battery technology continues to evolve.

Then the company Sony utilizes the findings Waldemar Junger 's products in various product variants in 1991. Utilization charger provides many advantages for the development of technology and communication tools. In addition, the presence of the charger gives a distinct advantage to users because it saves time and money compared to buying a new battery every battery has been depleted of its electrical capacity.

2.3 Green Science

Green Science is defined as the application of science and scientific thinking by using environment-friendly technology is based on a variety of disciplines. Therefore, to understand global warming, pollution, and its effects on the earth and its contents and how we can overcome the effects that caused the necessary scientific basis

obtained from the study of science supporting the approach.

Green Science is defined as the science and technology that menerepakan the principles of effectiveness and efficiency in utilizing natural resources and with regard to their use of sustainability by using technology in a clean or environmentally-friendly technology as for renewable technologies , namely solar technology, wind and water (Tilaar, 2011:5-6).

Green science and technology are closely dependent on analysis / assessment process and consider the life cycle of product design through manufacturing, distribution, use, and recycling. The purpose of life cycle analysis is intended to determine, quantify and minimize sources of environmental, economic and social impacts (Tilaar, 2011:140).

2.4. Green Design

Green Design is a design issue that continues incorporated by foreign designers, through discourse, or innovative works in their green product. Discourse green design is not static, but continue to be developed until now.

Green Design is also a very broad term covering many aspects. Starting with a smart choice of materials, such as renewable resources or low impact materials. To take it a step further, green design around intelligent design. It is about designing for disassembly / recycle capabilities and allow for other uses once the product has reached the end of its original purpose. Green design can also just encourage sustainable behavior by enforcing good behavior or create new behaviors.

According to In Hundal (2001) Green design has four goals if implemented in the design of the product will be able to increase the production of environmentally friendly, high quality and economical.

2.5. Ergonomics

2.5.1. History of Ergonomics

The term "ergonomics" was coined in 1949 started but the activities associated with them have sprung previous decades (Nurmianto, 1996: 3-5).

2.5.2. Definition of Ergonomics

The term "ergonomics" is derived from the Latin ergon (work) and nomos (natural laws) and can be defined as the study of human aspects in the work environment are reviewed in anatomy, physiology, psychology, engineering management and design.

Ergonomics is the study of man in his quest to improve comfort in the work environment. Method approach to analyzing the relationship between humans and the physical facilities. Benefits and purposes of the application of this knowledge to reduce discomfort during labor. Thus ergonomics useful as a deterrent to media fatigue as early as possible before eventually result in chronic and fatal (Nurmianto, 1996:4).

Similarly with regard to the optimization of ergonomics, efficiency, health, safety and human comfort in the workplace, home, and leisure. In the study of ergonomics need a system where human, facilities and environment interact with the overriding goal of adjusting the working atmosphere by human. Ergonomics is also called as the "Human Factors". Ergonomics are also used by various experts / professionals in the field, for example: anatomy, architecture, industrial product design, physics, physiotherapy, occupational therapy, psychology, and engineering industries. (The above definition is based on the International Ergonomics Association). Besides ergonomics can also be applied to the field of physiology, psychology, design, analysis, synthesis, evaluation of work processes and products for entrepreneurs, managers, government, military, faculty and students.

2.6. Definition of Product

According to Kotler and Armstrong (2001: 597), which is defined as the product is something that is offered to the market to get attention, to be bought, used, or consumed to satisfy a desire or need. The definition of the product is a physical object, services, people, places, organizations, and ideas (Dudung, 2012: 96).

Product is anything that can be offered to the market for attention, possessed, or consumed to satisfy the desires and needs. Products include physical objects, services, people, places, organizations and ideas. Products include more than just tangible

goods (can be detected by senses). If defined broadly, products widely covering objects, products or mix From all the above form. Services is a product that consists of activities, benefits, or the satisfaction of being sold, such as hair clippers, tax preparation, and home improvement. services basically realized (not detected by senses) and does not result in ownership of anything.

2.7. Product Design

Product design, or in the language of science is also called Industrial Design, is a scientific field or profession that determines the shape / form of a product manufacturing, processing forms to suit its use in accordance with the capabilities and production processes in industries that produce them. For example: product designer to design a chair that not only looks good chair, but also be comfortable and easy to occupied in production.

The basic aim of all efforts made by a person / a team of product designers in the works is to make life more convenient, enjoyable, and efficient. Comfortable office chair, comfortable kitchen knife used by the elderly and the toys are played and can stimulate children to learn are examples created by the product designers produced with studying human activity at the time of the work, at home, or at other places. By studying the parts of products that directly interact with human users, it is expected to be generated in addition to products that are safe for the environment. At the end the touch from the people and product designer borns an elegant product, which makes people want to buy (Dudung, 2012:113-114).

2.8. Definition of Industrial Design

Definition of industrial design is a creation of shape, configuration or composition of lines or colors, or lines and colors, or a combination thereof in the form of three-dimensional or two-dimensional static and gives the impression it could be realized in a pattern of three-dimensional or two-dimensional and can be used to produce a product, goods, industrial commodity or handicraft (Hesket, 1986:219).

Basically the definition of design is very diverse. Some argue that the same design with the word "draft" which according

Purwadinata meaning as compose, modify, fabricate. Further elaborated that there is no definition of the most appropriate to satisfy us that the definition of the design depends on where a person is approached. The design can also be interpreted as a human activity and the environment to create artificial perbendaan processed treasures of nature.

Khazanah is then in line with the time that is always changing and fully characterized by innovations to create a culture of life.

2.9. Definition of Technology

Many people who use the technology, but not many people actually know what the definition of technology. Therefore, many people cannot distinguish the technology. Therefore, here I'll give a little explanation about the meaning of technology.

Technology has many different definitions. Each one expressed by some books and experts in the field. One was from the Indonesian dictionary, Poerbahawadja Harahap, and several other experts. Current technology has improved a lot in the community. The use of technology by the man himself begins with simple tools made by humans in ancient times. For instance in automotive technology, perhaps the wheel is currently regarded by ordinary humans only. But in ancient technology is the most innovative technology, because the wheel is very helpful for the human journey. However, when compared with today's technology, the wheel may only history.

2.10. Wireless

The definition itself is wireless technology without wires, in this case is doing telecommunications using electromagnetic waves instead of cables as media intermediary. With this wireless technology is growing very rapidly once, by naked eyes we can see the increasing number of mobile phone use, besides it also develops wireless technology used for internet access. Wireless networks typically use one of two topologies, namely Ad Hoc or infrastructure. In Ad Hoc topology commonly known as peer-to-peer, any computer equipped with a wireless adapter that sends and receives data to and from a computer and another computer (Zam, 2012: 1-3).

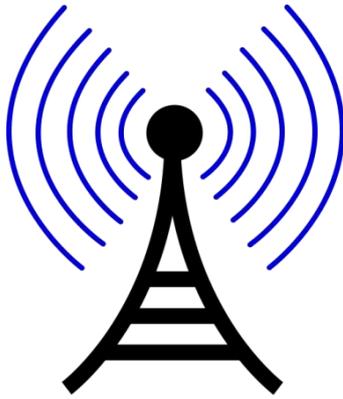


Figure 1. Wireless Network (wifi)

In the infrastructure topology, each computer sends and receives data from an access point. While wireless history itself first appeared in the late 1970s. IBM released the results of experiments in designing a WLAN with IR technology, other companies such as Hewlett-Packard (HP) to test the WLAN RF. Both of these companies only achieve a data rate of 100 Kbps. Because they do not meet the standards of IEEE 802-11 Mbps LAN that is not marketed product. New in 1985, (FCC) set the ribbon Industrial Scientific and Medical (ISM band) is 902-928 MHz, 2400 to 2483.5 MHz and 5725-5850 MHz unlicensed, so the development of commercial WLAN entered a serious stage. Then the WLAN 1990 can be marketed with a product that uses spread spectrum techniques (SS) in the ISM band, unlicensed 18-19 GHz frequency and IR technology with data rate > 1 Mbps.

2.11. Wireless Work

By definition is a wireless network is a collection of interconnected computer through the connecting medium (air) and be able to work together and share facilities with each other to form a group. A network needs to be formed in order to use the facilities together with hundreds of other computers connected into the network.

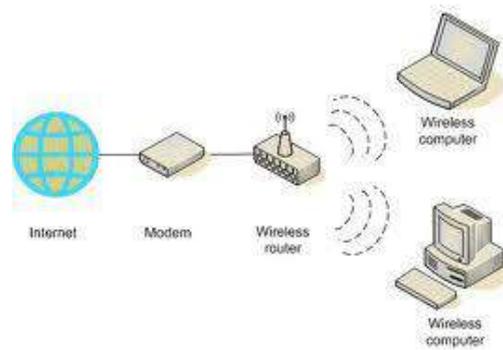


Figure 2. System of Wireless Network (wifi)

Wireless network or wireless network is in principle the same as an ordinary computer using a cable network. The only difference between them is the medium used. Wireless network / wireless media use air (radio waves) as the data traffic lane. There are several things that led to the development of wireless technology for computers:

- The emergence of devices based on radio waves, such as walkie talkies, remote control, handphone, gadgets, and other radio equipment that marked the start of the process of the wireless communication.
- There is a need to make computers as easy to carry goods (mobile) and is easily connected to the existing network.

How to move the energy or energy transfer Wireless charging utilizing the magnetic field to move the energy of the two objects, energy is sent through to an electronic device, wherein the energy is transferred through the can recharge batteries or run an electronic device.

Just like a transformer, induction coil produces an electromagnetic field of the base station and the mengisian second induction coil (in electronic devices) takes power from the electromagnetic field generated that can be converted into electrical energy to recharge battery. Several developers / vendors got interested in this technology, such as Intel and Integrated Device technology has signed a cooperation contract to develop this wireless charging technology.

2.12. Wireless Charging Technology

Crowded discussed recently began a new feature for charging the phone without having to plug in the cable, or the so-called wireless charging. But here the term wireless signals do not imagine like Wifi or

Bluetooth that enables the exchange of data between devices. Wireless charging is in principle just moving electrical energy from a battery source to the phone (or other device such as a tablet) by utilizing the principle of electromagnetic (Wikipedia.org).



Figure 3. Wireless charging Workflow

The principle of magnetic induction transfers energy from one place to another without the need for cables. Required electronic components shaped coil (coil) to create a magnetic field into energy to charge the battery.

The principle is then used as a wireless charging technology in mobile phones. Requirement phones already have to support this technology, and also need no magnetic field generator (can be shaped base which is connected to the mains) then we simply put the phone on top of it until the energy can move. So during the process of charging the battery, the phone still has to be close to its base.

2.13. Material

2.13.1. Plastic of Polycarbonate / Acrylonitrile Butadiene Styrene

Polycarbonate / Acrylonitrile Butadiene Styrene (PC / ABS) is a type of plastic that is used as a mixture of PC with ABS which produces a very strong plastic, used in interior and exterior car parts, and materials for the mobile phone.



Figure 4. Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) plastic

2.13.2. Rubber

Rubber is a hydrocarbon polymer latex contained in some plant species. Rubber is the main ingredient manufacture of tires, some health tools, tools that require flexibility and shock-resistant. Elastic rubber which is flexible rubber which is easy to use based on their consumption.



Figure 5. Elastic rubber

2.13.3. Stainless Steel

Stainless Steel is an iron compound that is capable of preventing the corrosion process of metal or solid metal used for jewelry that tends to rust or corrosion of ordinary steel or other metal jewelry.



Figure 6. Stainless Steel

2.14. Color Theory

In Asia as users color associated Ngina gods. In India, the god Brahma is represented by the color yellow. Siva as the destroyer god symbolized by the color black. Yellow is Ngina Buddhist, monks always wear yellow juba. Coat Confucians also use the color yellow. In China, the direction of the Ngina symbolized by the color green, white west. For chinese primary colors, namely five, red, yellow, black, white, and green. Fifth is the color associated with the elements of the body of the china, namely fire, metal, wood, soil, and water as well as the five evils to be avoided, the five happiness, five goodness, faithfulness and five teachings (Darmapirwa, 2002:36).

3. RESEARCH METHOD

In the case of this observation, the authors will use unstructured observation method, in because the authors conduct a review into Roxy Square Mall in Jl.KHHasyim at Ashari, Jakarta western personally. The authors obtain the data and images on Power Bank, also known as Portable Chager.



Figure 7. Power Bank/Portable Charge

Power bank, if translated from English into "Power storage". From its etymology is clear that the power of banks to function as a power or energy storage areas that are often required by today's gadgets. Why is the power of banks so important? Whereas in previous eras just POWERBANK not so well known by the users of the gadget. This is because the growth increasingly sophisticated gadgets. The number of features in the gadget used lead battery power is also increasing, so the faster the battery runs out of power. Power Bank is

designed especially for the businessman, student, traveler, and a wide range of people who do not always have much time to charge gadgetnya home. With POWERBANK user can charge the gadget without having confusion gadgetnya find resources / electricity.

In mid-2012, power bank already widely known by the user / users of the gadget. Whether it's a power bank for smartphones, blakcberry, iphone, tablets, and other gadgets. Even the power of banks also vary according to the ability to power storage capacity. A unit for measuring power storage capability is mAh power bank.

3.1. Interview Method

Method of interview is a conversation that is done with a specific purpose, and this conversation is usually done by the interviewer who asked questions and interviews that provides an answer to that question.

In this interview methods conducted a review of the material, it could be a result of the problems with the battery life and power bank gadgets used at the time of usage. In the literature review, have elaborated on some of the materials that will be considered in making the product or portable power bank charger.

According to Mr. Lukman, this time almost everyone memepunyai or pocket gadget. Any gadget that belongs not only have one, sometimes biased carrying two or three or even more than three gadgets at once is quite sophisticated. And increasingly sophisticated gadgets and a lot of features and applications contained on electronic devices, the more features and applications that are used on the faster gadgets battery power or energy in the battery is in use rapidly diminishing. Not surprisingly, the gadget users tend to run out of battery power when on the go and looking for an electric socket for recharging on their gadget. At the time of browsing or doing work through the gadget in the middle of the trip, things that can make or perhaps most upset is running out of battery.

Utilization of the bank or a portable power charger increasingly widespread, not only for mobilephones, smartphones, and tablets but penetrated up to digital cameras, and gaming Playstation Portable (PSP) and

laptops. Usage flexibility is what makes us want to have. However, not infrequently we imagine a high price for this one device. When in fact the bank began to affordable power prices saat.

In general, the price of the power of banks based on the storage capacity of power / electricity. Currently, in Indonesia has been circulating POWERBANK various sizes based on storage capacity power / electricity. That is 1500 mAh, 1800 mAh, 2000 mAh, up to 15000 mAh. Price range power even when the bank is around Rp. 250.000 For 5600 mAh capacity. Meanwhile, the power of banks with 11000 mAh capacity there is in the official price for 450.000 Rupiah. Of course, the range of prices according POWERBANK capacity. The benefits of this enormous power bank for an activists are often busy with their daily activities are more details to the users of mobilephones, smartphones, tablets and others.

In terms of comfort at the time of use / consumption power of banks is already comfortable. But more difficult when at the time of charging the battery in the gadget. And at the time of the trip and doing the work by using gadgets, gadgets and power must always be held as bank must always hold hands at the same time.

3.2. Documentation

Documentation of a process of recording data information storage or facts that have meaning in the implementation of both writings, recordings such as voice, video and photos while doing research. Some photos and images are obtained as research for various types of Power Bank various brands and capacity:



Figure 8. Power Bank 2600 mAh



Figure 9. Power Bank 3000 mAh



Figure 10. Wrist Charger

Battery Type on the power of banks one of which is li-ion or lithium ion. And the following picture on battery power bank, namely:



Figure 11. Power Bank Battery

3.3. Mindframe



Gambar.3.14 kerangka berpikir (Sumber: Efrhenrycx, Data pribadi, 2012)

Figure 12. Mindframe

4. RESULT AND DISCUSSION

4.1. Concept

In making the concept of power bank / portable charger, it will be done with the use of a key element in the design using the 5W 1H, which consists of what, who, when, where, why and how. With the following description :

4.1.1. What

Power bank (charger wrist) is an energy storage device / electricity used for recharging the battery in the gadget.

4.1.2. Who

Power bank to be created is intended for all people young and old with male gender and women aged 18 years or older who had engaged in which users are busy as gadget users. Who are at the age where the user is busy doing activities such as lectures, work and others. Because at the age of 18 and over the wearer very busy with day-to- day activities aktivitas with very dependence by means of communication. The nature of modern life and the consumer has always followed the growing trend.

4.1.3. When

Because the power of banks is something that is needed at the time of recharging batteries in gadgets circumstances when the battery runs out. Thus the targeted power bank designed in 2015.

4.1.4. Where

Place the target market is in the urban and rural areas. As in the capital, Jakarta. As we know that Jakarta is the center of the town in Indonesia, which has the technological and economic progress and growing fast. And also the average population who always follow the trend of late has a place to stay in Jakarta.

4.1.5. Why

To provide convenience to the user / users of the gadget when performing activities anywhere and anytime with the aim of improving the ease and comfort at the time of charging gadgets, especially in places that are impossible to reach, or the presence of an electric plug or power source.

4.1.6. How

Make it easy for the user / users in penngisian batteries efficiently and effectively. That which uses the power of banks charging (charger wrist) user doesn't need to hold the power of the banks because the banks are taking power in the wrist like a watch to wear as usual.

4.2. Data analysis

After conducting a literature review and research methodology, which has been collected, it will be analyzed the data to find the data that will be used in the manufacturing phase power bank / portable charger.

4.2.1. User

In this section we will discuss about the user who is also called consumers that include age, gender, environment.

Age targeted or target is all ages (18 and over), the age in which users who have started to engage busy as gadget users. With that done aktivitas like college, work, and others. So they are frequent users of dependence with the use of gadgets.

While the gender is intended to female and male. Due to the use of this product, with all genders can use it. In terms of color selection that implement elements to go green, the color selection is more concerned where comfort, freshness and friendly.

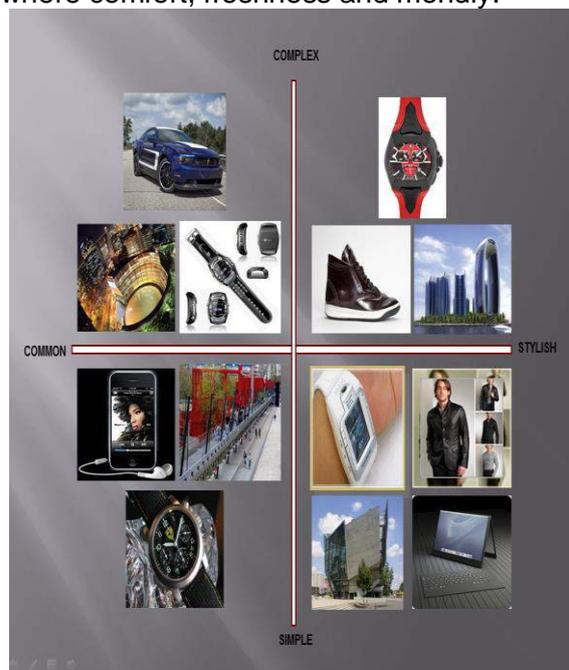


Figure 13. Image Chart

The authors apply social class is the upper middle class with average income.



Figure 14. The user characters

For the social environment is an environment that has a rapidly growing trend. With high levels of power consumption on the development of products and gadgets.

Elaboration of the nature of the intended user or users, which has properties like gather in cafes, shopping mall, traveling, and often perform activities outside the home.



Figure 15. Image Board

4.2.2. hypothesis

After going through the stages of research and analysis of the problem, came to the stage hypothesis. That which will answer the questions and conclusions to be made.

For this kind of power my bank attractive solution by using the power of banks "wrist charger", which is where the power of the banks differ from other banks power when using it. because this is the type of power bank charger power bank which means the wrist is worn on the wrist like a watch to wear, without having us hold, or are usually put in the bag, or also put in a pants pocket. At the bank 's power usage gadget that can be used for charging its battery can be used to some existing gadgets such as mobilephones, smartphones, tablets, and portable gaming.

In terms of comfort on the power consumption of this bank is more practical and simple for the user when the battery recharging gadgets and drain electrical power bank charger that does not use Wi-Fi as charging the battery in general. And the user even more freedom of movement when charging takes place during activity.

For wireless charging will usually be provided placemat that is connected with its own charger and smartphone use cases in order to be able to charge to put on the saucer. But this is slightly different because it can be able to charge anywhere with a distance of 1-2 meters without having to connect the charger cable.

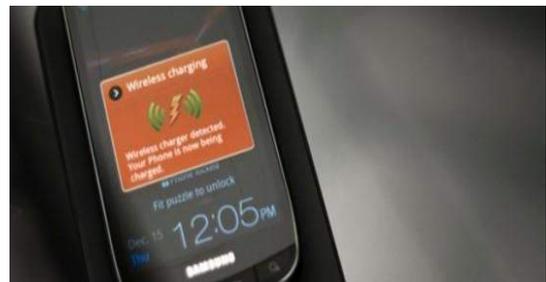


Figure 16. Wifi Charging for smartphone

4.3. Key Word

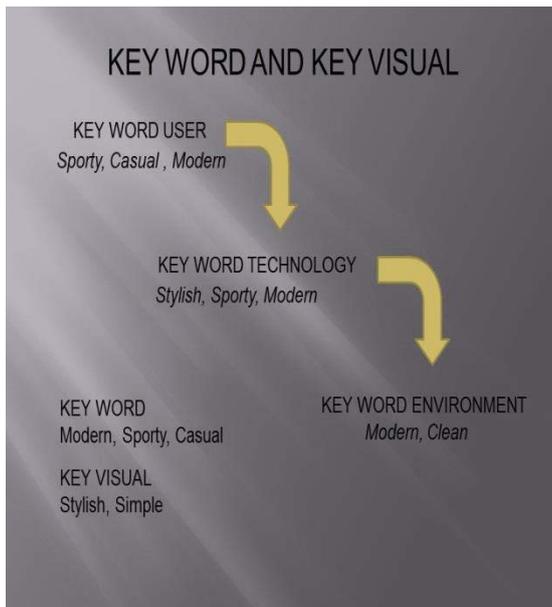


Figure 17. Key Word



Figure 18. Brainstorming Sketches

Conclusion of Key Visual and Key Word is design to draw attention to the product when used are stylish and modern design. Stylish because people who use the product will be confident in doing their activities and can lift the image of the user's way, while simple because the product is easy to use.

4.4. Design

From the analysis and the design concept, which will require several alternative designs to choosing the final design of this product.

Selection of the design include:

- brainstorming Sketches
- Developing Sketches
- Detailing Sketches
- Alternative Sketches
- Final Sketches
- dimension
- orthogonal View
- exploded View
- 3D Final
- 3D Render (Diorama)
- mock Up

4.4.1. Brainstorming Sketches

Idea generation methods most widely known is brainstorming. Brainstorming is a method used to generate a large number of ideas that most of these ideas will be discarded, but maybe there are some ideas that have been recognized as a valuable progress and will be selected.

4.4.2. Developing Sketches

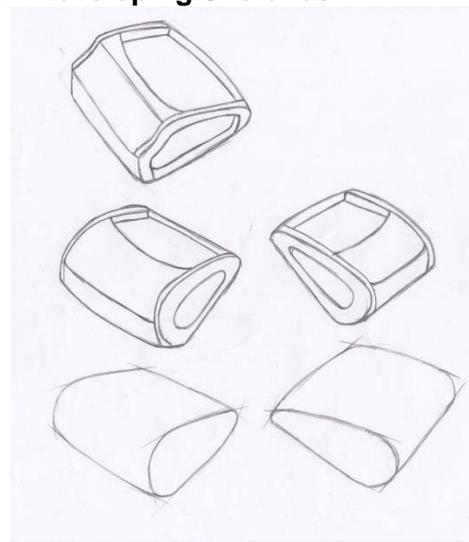


Figure 19. Developing Sketches

4.4.3. Detailing Sketches

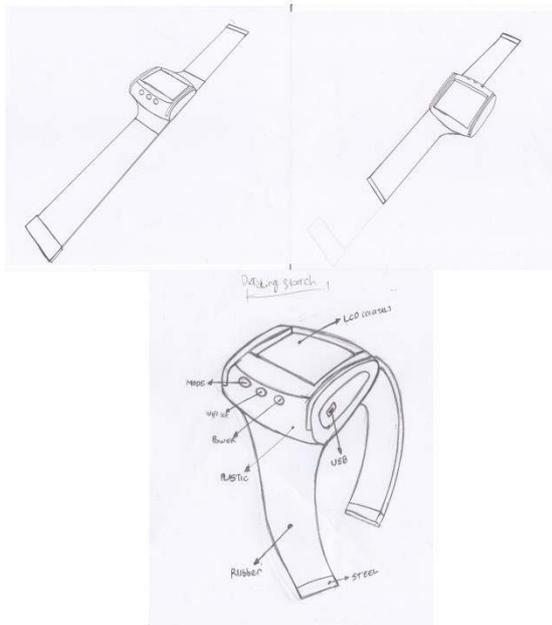


Figure 20. Detailing Sketches

4.4.5. Final Sketches

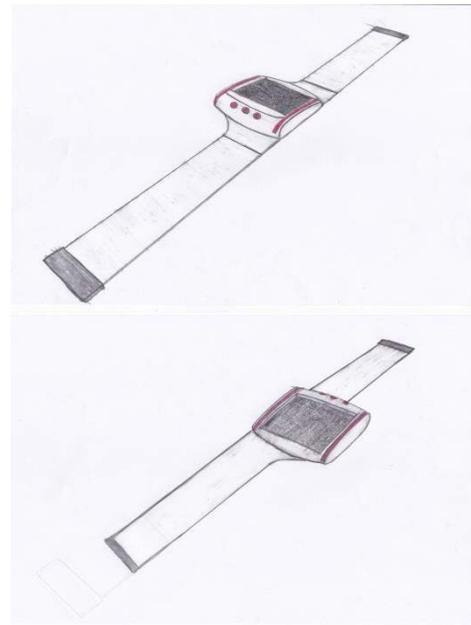


Figure 22. Final Sketches

4.4.4. Alternative Sketches

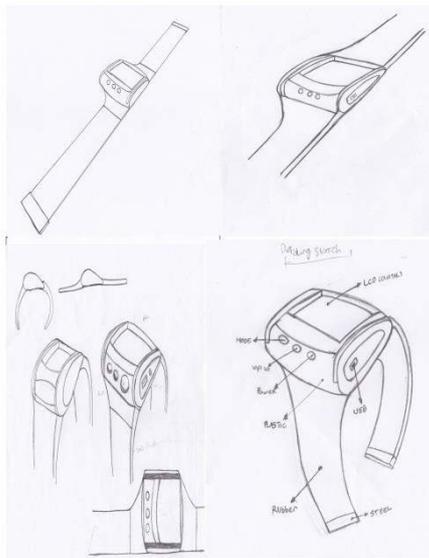


Figure 21. Alternative Sketches

4.4.6. Dimension

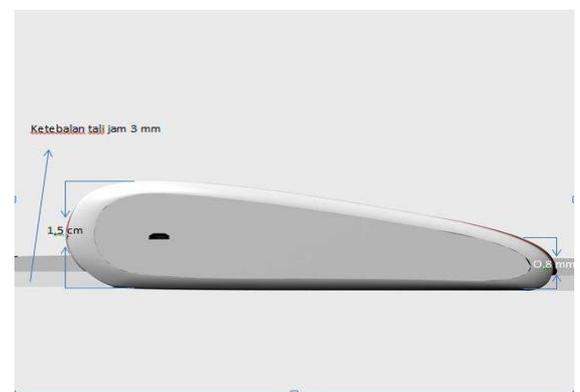
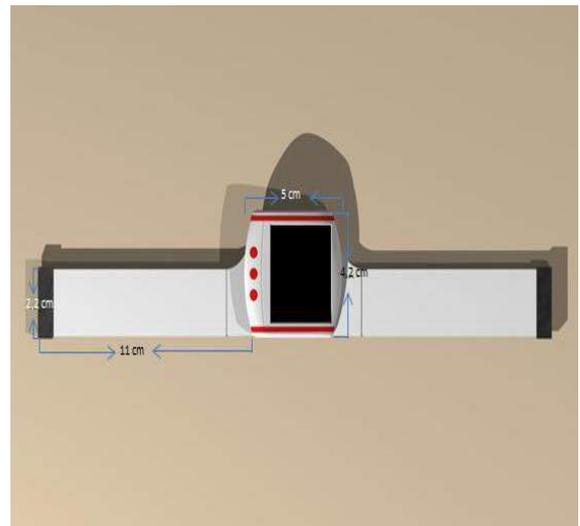


Figure 23. Dimension

4.4.7. Orthogonal View

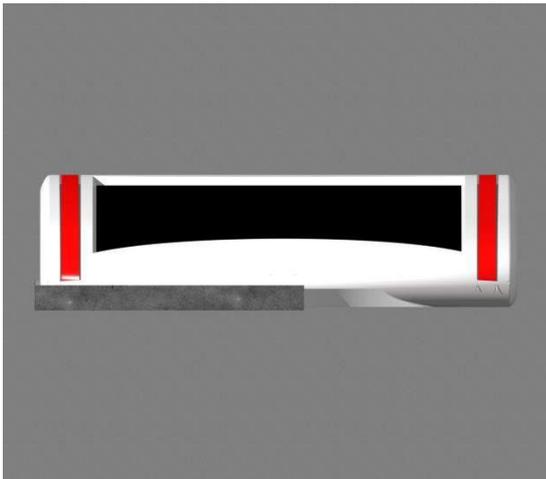


Figure 24. Front view

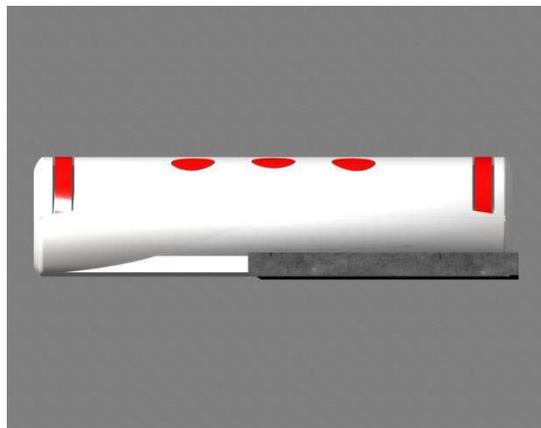


Figure 25. Rear view

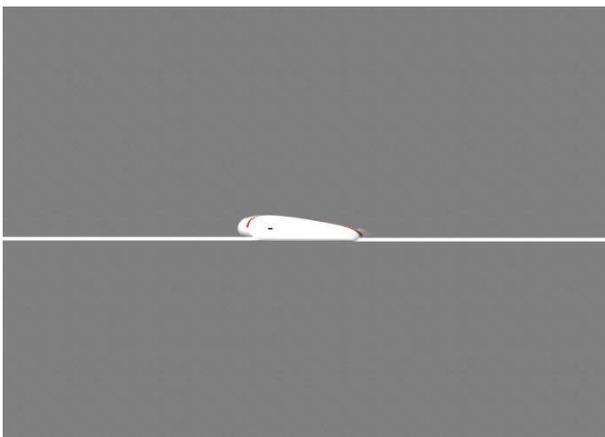


Figure 26. Side view

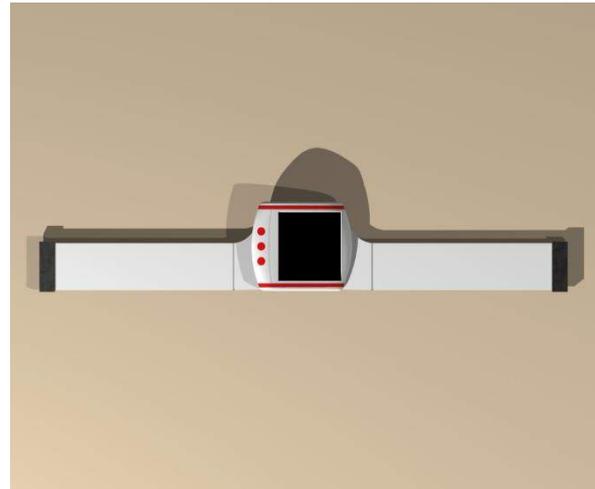


Figure 27. Top View

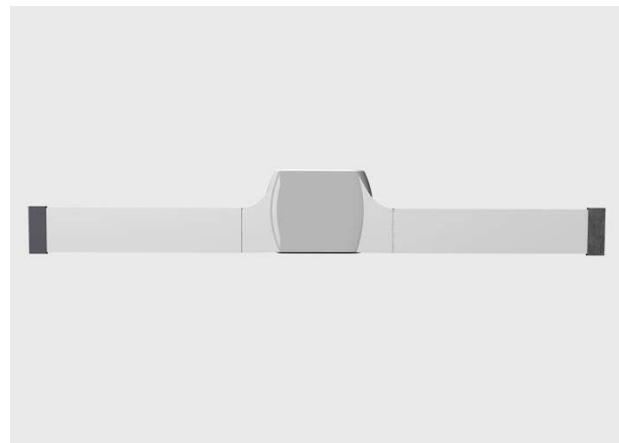


Figure 28. Bottom View

4.4.8. Exploded View

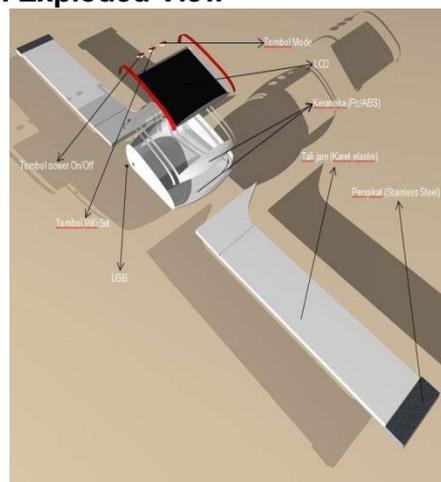


Figure 29. Exploded View

4.4.9. 3D Final



Figure 30. 3D Final (Front)

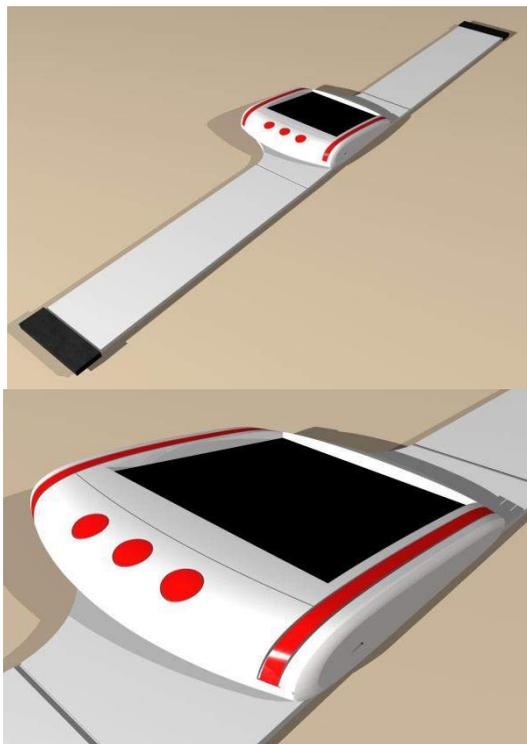


Figure 31. 3D Final (Rear)

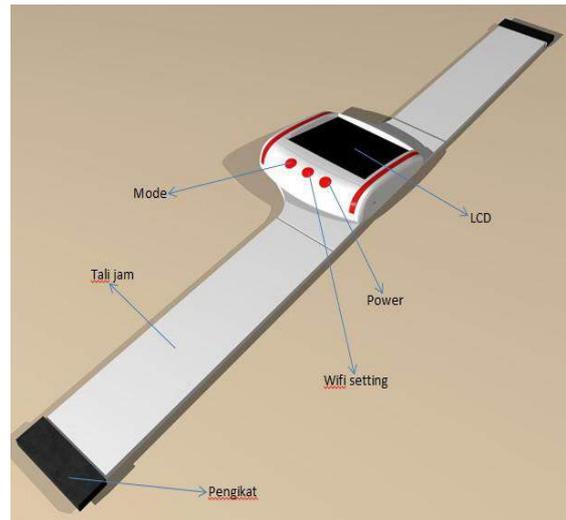


Figure 32. 3D Final (Detail)

4.4.10. 3D Render (Diorama)



Figure 33. 3D Render (Diorama 1)



Figure 34. 3D Render (Diorama 2)

4.4.11. Mock Up



Figure 35. Top and front detail



Figure 36. Rear And bottom detail



Figure 37. In the box

5. CONCLUSIONS

The conclusion that can be drawn from product design tools rechargeable batteries in electronic communication tools are:

- Design tools rechargeable battery are simple and practical emphasis on design tools rechargeable battery which can help the user to use an electronic communication device to recharge the battery when the battery is low.
- In the selection of materials, the materials used are plastic materials, rubber, and steel. The plastic as the material that makes the material is not too expensive and also plastic can withstand impact.
- In terms of comfort to refill tool is more practical for use during battery recharging and tools do not need to be held and how the filling was using a wireless charger.

6. REFERENCES

- (a) Tilaar, Martha (2011), *Pioneers in Science*, Jakarta: Dian Rakyat.
- (b) Nurmianto, Eko (1991), *Ergonomi Konsep Dasar Dan Aplikasi*, Jakarta: PT. Candimas Metropole.
- (c) Dudung, Agus (2012), *Merancang Produk*, Bandung: PT. Remaja Rosdakaryo Offset.
- (d) Abdullah, Thamrin., Thantri, Francis (2012), *Manajemen Pemasaran*, Jakarta: PT. Rajagrafindo Persada
- (e) Kotler., Kevin., (2008), *Manajemen Pemasaran*, Indonesia: PT. Macanan Jaya Cemerlang.
- (f) Sachari, Agus., Sunrya, YanYan (2002), *Sejarah Desain Dan Perkembangan Desain Dan Kesimpulan*, Indonesia, Bandung: ITB.
- (g) Heskett, John (1986), *Desain Industri*, Jakarta: CV, Rajawali.

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