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# Wearable Design Technology for Mobile Devices

Zamila Binti Abu Zainal[a1]*& Marziana Binti Yaacob[a2]*

[a12] *Politeknik Ibrahim Sultan*

**Abstract**

In the new era of technology, portable devices are important to connect with the outside world. The Millennial (Y generation) are the new generation that lived in the fast-moving era of technological. In this new era of technology electronic devices has become increasingly mobile, portable, and easy, both in physical form and in their application scenarios. This is where a wearable design technology will in cooperate to give a better accessibility and use. From the natural energy source to generate portable devices technologies: smart phone, tablet, palm-top computers that are being integrated directly into a garment (smart clothing) or body-worn accessories. Wearable design technology needs to combine two different elements that are fashion and technology to design a new concept of intelligent life-style for the Y generation (the millennial) to suit their needs. The objectives in this research is (i) to offer a wearable design technology for the Y generation in the concept of intelligent life-style for mobile devices, (ii) to design a wearable design technology that are wearable, provides energy through natural source and perception through aesthetic looks, and (ii) to encourage the Y generation to adapt themselves in using wearable design technology in meeting the new lifestyle. This research is limited to combined solar energy to generate portable devices integrated directly into a garment (smart clothing) or body-worn accessories and the target market is for the Y generation aged between twenty-five to thirty years old. The research methods that are used in this research are qualitative and quantitative. In the research findings the researcher has create and designed a wearable design technology for mobile devices for the Y generation with the futuristic look. In the conclusion it is not possible to create a design that have to combine two different areas. The researcher recommends that before designing process could be done, the engineering element of the size, flexibility, weight and durability of the solar should be test first.



*Key-word: - Wearable Design Technology, Smart Clothing, Intelligent Life-style, Solar energy*

## 1. Introduction

A research wearable design technology where fashion meets technology to design a new concept of intelligent life-style for the Y generation (the millennial) to suit their needs. When two different areas in cooperate between technology and fashion. In this new era of technology electronic devices has become increasingly mobile, portable, and easy, both in physical form and in their application scenarios. This is where a wearable design technology will in cooperate to give a better accessibility and use. From the natural energy source to generate portable devices technologies: smart phone, tablet, palm-top computers that are being integrated directly into a garment (smart clothing) or body-worn accessories (Lee, 2005).

Wearable design technologies are clothing and accessories that combine advance computer and electronic technology. It is close to the body and enables technology to be used in situations where it normally is not possible. The designs often incorporate practical functions and features as well as making a statement or establishing a technological look.

* Zamila Binti Abu Zainal. Tel.: +0173575558 ; fax: 07-261 2402
*E-mail address*: zamilazainal.pis@gmail.com

It is a term used to describe many different forms of body-mounted technology, including wearable computers, smart clothing, functional clothing and fashionable technology. The process to make a wearable design technology for mobile devices must be integrated across the disparate disciplines (Lee, 2005).

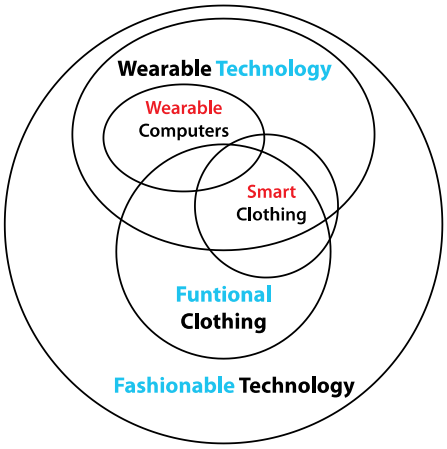


**Figure 1** Relationships among wearable design technologies

**Problem Statement**

Wearable technology mainly known among the western countries and it has been designed mostly to suit the climate and technology. Designing a wearable design technology for mobile devices to suit the new concept of intelligent lifestyle needs to combine between two different areas of engineering and fashion (Lustig, 2005). The partnership has never looked complete for cooperation between technology and fashion (Chang, 2005). These two different areas have to work together in order to produce good product to suite the new concept idea of intelligent lifestyle by the younger generation the Y generation.

The search for power solution has always been an issue for wearable design technology. There have been a few proposed solutions to generate power but until now none are practical. Suggested energy source includes solar heat and movement. The characteristic to generate high capacity energy source output from small, lightweight, flexible and rechargeable are not possible at the moment (Hurford in McCann & Bryson, 2009).

**Aim of study**

The research aims is to design a wearable design technology in the concept of intelligent life-style for the Y generation (the millennial) to suit their needs.

**Objectives**

a. To offer a wearable design technology for the Y generation in the concept of intelligent life-style for mobile devices.
b. To design a wearable design technology that are wearable, provides energy through natural source and perception through aesthetic looks.
c. To encourage the Y generation to adapt themselves in using wearable design technology in meeting the new lifestyle.

**Research Question**

This research aims to answer some research questions that are relevant with the research and important to the researcher. The research questions are:

a. Who needs wearable technology?
b. What is the design for wearable design technology?
c. Why do they need wearable technology?

**Significance of study**

Wearable technologies are known among the western countries and it has been designed mostly to suite the climate and technology. This product will give a new idea of fashion and technology combined to suite the intelligent life-style for the Y generation. This research will give a new idea of technology and fashion in cooperated together using solar energy to generate portable devices.

**Limitations**

The limitation on this study is to combine two different areas, design and engineering. To combined solar energy to generate portable devices integrated directly into a garment (smart clothing) or body-worn accessories. The target market is for the Y generation aged between 25 to 30 years old

## 2. Literature Review

Fashion and engineering are two different major industries traditionally. When these two major industries collaborate in this cross-disciplinary sector to develop new products it caused a major difficulty in understanding the language and work practice. To suits the needs of a new way in sensing the world, it is time to radically rethink the concept of what intelligent lifestyle actually means. Seymour (2000) says that fashionable technology refers to the connection of design, fashion, science, and technology.

According to Lee (2005) the term 'wearable technology' refers mainly to electrical engineering, physical computing, and wireless communication networks making fashionable style wearable works. Lee (2005) also describe the term ‘wearable’ is generally related to wearable computing components that drive the belt clip worn on the body in a pocket or slings. They are portable, task-oriented work accessories used by the cooperative who need information at their fingertips. According to Mann (1998) a wearable computer is a computer that is subsumed into the user's personal space, controlled by the user, and has both the patience and the interactions of operations, which have always been and always accessible.

Braddock & O'Mahony (1999) says that the new technologies in textiles contemporary are narrowing the gap between art, design, engineering and science. Technology and design are coming together to produce new high-quality product for the consumer not only for the technology but also with the design elements to express their individualistic.

Lee (p43, 2005) says the terms describing a genre of clothing that functions at a whole new level - electronic. Smart clothing, functional clothing and fashionable technologies are the new fashion for the future trend to implement toward the era of technological. With all kinds of technology product such as the portable devices like smart phone, tablet, palm-top computers that are important for the user to stay connected. Wearable design technology will help to recharge the devices using natural source of energy.

According to Seymour (2008) there are a few categories such as electronic fashion, interactive interfaces, scientific couture, sensual being and tangible touch, wearable explorations and social fabrics that could show the fashionable technologies. In each category fashion and technology are not different apart from each other to create new idea of design and technology.

**Figure 2** Levis Red Wire DLX Jeans (2006). Hong Kong with Levi Strauss & Co Europe S.C.A (Belgium). Keywords: wearable iPod controls, Red Wire DLX jeans, Fiddler joystick, Seymour (2008)

**Figure 3** Velveteen Edwardian Jacket with iPod controls (Angel Chang 2007) Keywords: fashion ready-to-wear, camouflage, heat-sensitive.

Natural energy source such as the solar energy to generate portable devices are one way to go green. Hurford in McCann and Bryson (2009) says that generation of power has always been and will continue to be a problem for smart clothes and wearable technology. The perfect size of battery in generating power for portable devices that is small, lightweight, flexible and rechargeable with high capacity and output are hard to combine all the features in one technology especially for wearable. Danigelis (2012) takes the view that every minute on the activities, outdoor adventurers dreamed to leave the battery. Heimbuch (2010) comment that there seems to be little indication that fashion incorporating those solar cell is improving at all. There are still much to improve in the designing part for smart clothing in using flexible solar panel.

As Zemke, Raines & Filipczak (2013) says that the millennial are the first generation to grow up immersed in digital media. The millennial are also called as the Generation Y, the Net Generation, and the Digital Generation. They are the generation who are interested in the advancement of technology and communication and connected 24/7 globally with colleagues, parents, information and entertainment. Zemke, Raines & Filipczak (2013) states that the Millennial are born between the year 1980 until 2000. According to Zemke, Raines & Filipczak (pg.121, 2013) digital technology – and it was as natural as breathing for Millennial kids.

"For them, technology is as natural as air," says Frank Gregorsky as cited in Zemke, Raines & Filipczak (2013). Technology and the Y generation are not separable because of the era they are living in since they were born. The Y generation needs and use the technology as if they are one. They are living in the intelligent life-style where they live it in one sense or another. This is where wearable design technology will offer exquisite design and technical solutions integrated with everyday objects.


**Figure 4** The concept of intelligent life-style

## 3. Methodology

There are several methods used in this research to obtain data collection from primary data and secondary data by the researcher. The data includes sampling methods and analysis. In this third chapter the researcher focuses on the method used in this research study. A mixture of methods comprises of both quantitative and qualitative methods used to obtain the information needs in developing the research study for Wearable Design Technology for Mobile Devices. Quantitative method used in this research are in a form of pilot test by using questionnaires whereas for qualitative, the researcher made an in-depth study and evaluation based on observation. The data received will help to identify the objectives that have to be accomplished in doing this research. The information gained will be analyzed in detail to rule out any obscurity. Hence research will be carried out in stages until a conclusion can be made.

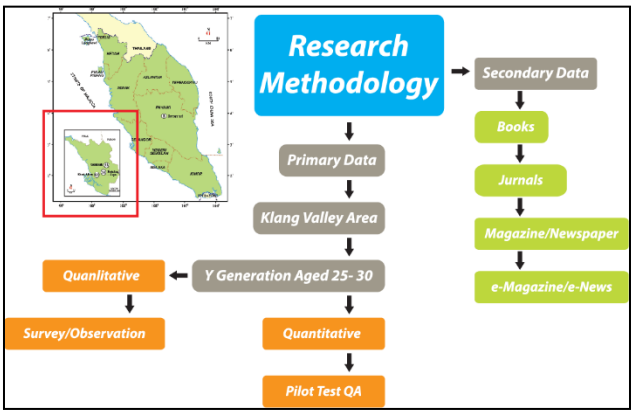


**Figure 5** Shows the research methodology for wearable design technology

The sampling begins with identifying the problem statement in this research. After the issued have been identified, questions are drafted base on the demographics and general knowledge on wearable design technology. Once the questionnaire have been drafted it can be distribute to the respondents. After the survey have been distributed and answered, the survey must be collected to be analyzed.

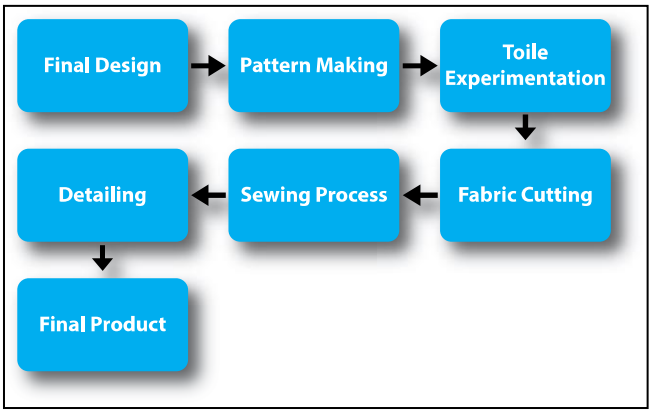


**Figure 6** Work flow on the first process of wearable design technology until final product

## 4. Analysis and results

Based on the results analyzed form observation session, the researcher found that the Y generation are attached with the technology and uses the portable devices most of the time. Through the survey conducted, the researcher focused on the respondent living in Klang Valley area aged between 20 to 34 years old. The survey that has been conducted on the 23 and 25 of November

2018 in Suria KLCC and Sunway Pyramid around 11.00am to 9.00pm from 164 respondent of the Y generation will guide the researcher throughout the design development process. There are two sections in this survey which are Section A for Demographics and Section B for General knowledge on wearable design technology.

**Figure 7** Observation along LRT Taman Jaya to KLCC route

Based on the data analyzed collected in for design preferences shows that 76 percent of the respondents are aware about wearable design technology. The respondent agreed that wearable design technology should combine between two different areas that are fashion and technology. Looking at Diagram 1 on products choose by respondent more on smart clothing by 37 percent rather than body-worn accessories less by 29 percent.

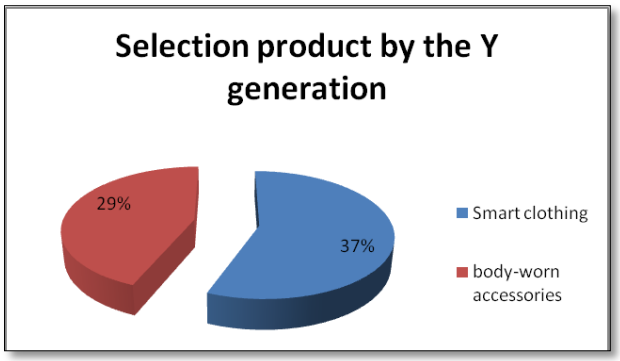


**Diagram 1** Pie chart shows the percentage of product selected by the Y generation

The analyzed data in Diagram 2 shows the element preferred by the respondent for wearable design technology. It shows the percentage choose practicality by 16 percent, technology by 14 percent, space or smart space by 13 percent, wearability by 12 percent, energy by 8 percent and connectivity by 9 percent. The respondent agreed that wearable design technology should be able to recharge portable devices using solar energy. The safety of using the solar energy does not shows any concerned for 80 percent of the respondent while another 10 percent shows concerned using the solar energy on their body. The analyzed data in Diagram 3 shows 60 percent respondent choose medium weight material while 40 percent choose heavyweight fabric for wearable design technology

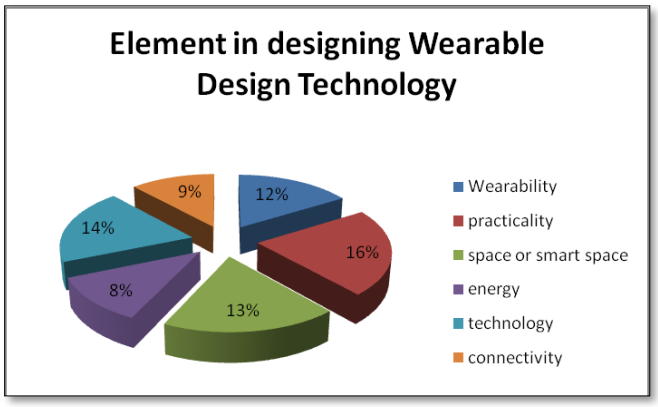


**Diagram 2** Pie chart shows the percentage of element in designing wearable design technology

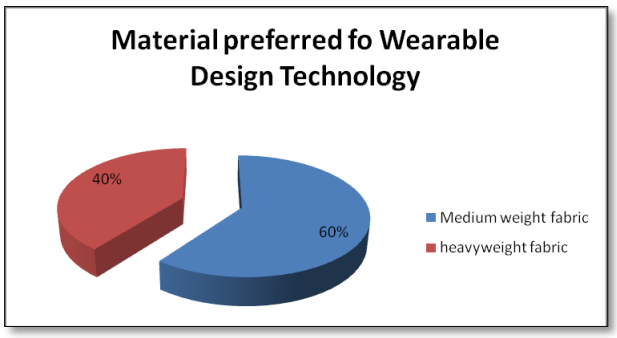


**Diagram 3** Pie chart shows the percentage of material used in designing a wearable design technology

The analyzed data in Diagram 4 showed the percentage of price preferred by respondent to buy wearable design technology. It shows that 52 percent of the respondents are willing to buy a wearable design technology priced range between RM300 to RM500. Meanwhile 45 percent of the respondents are willing to buy a wearable design technology priced ranged between RM500 to RM1000.

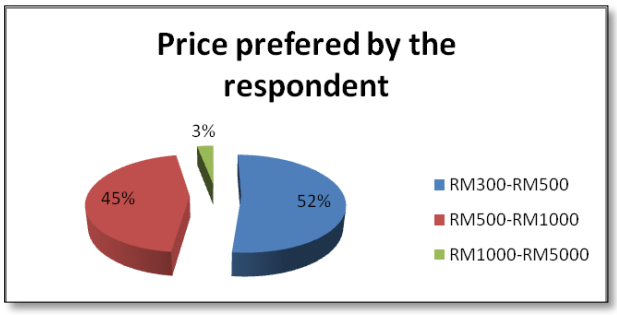


**Diagram 4** Pie chart shows the percentage of price preferred by respondent to buy wearable design technology

In the product development process, the researcher has done some toile to test the proportion and structure of the product. The process then goes to the making of the prototype using the actual material proposed. After the final product are finished the researcher had done a post test survey on the Y generation to get their opinion on the design, aesthetic look, usability and technicality on the solar charger attached to the design.

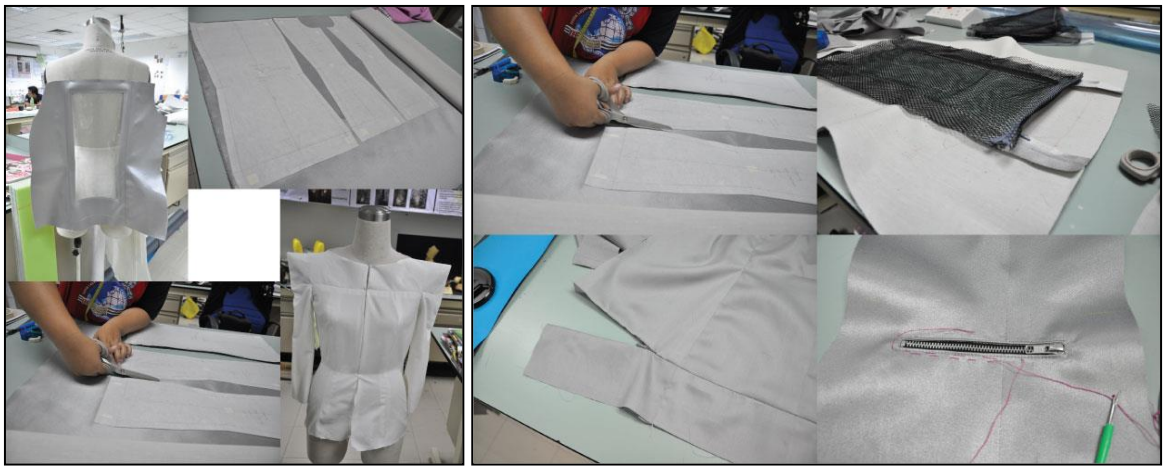

**Figure 8** Product assembly process

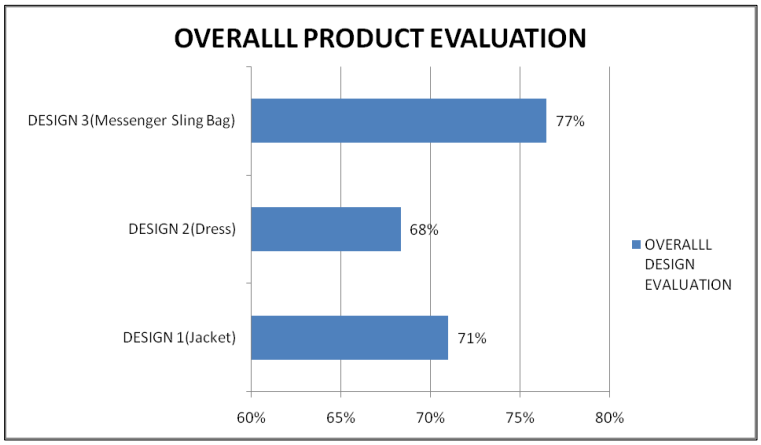


**Diagram 6** Design 1 evaluation (jacket)

## 5. Conclusion

In conclusion to the research conducted, it is concluded that wearable design technology has become a product that should be used by the Y generation to encourage them to adapt themselves in using wearable design technology in meeting the new lifestyle. The design offers a wearable design technology for the Y generation in the concept of intelligent life-style for mobile devices and also provides energy through natural source and perception through aesthetic looks using the flexible solar to recharge the portable devices. It is also useful for the consumer that always on the go. Looking through the final 3 products, the first product that is the jacket with flexible solar inserted at the back of the jacket are much more practical that the second product. The problem of doing the design refers back to the size of the flexible solar used to design the two products. Otherwise for the third product that is more practical in terms of usage where the sling messenger bag can also be worn as a back pack. The product also gets a positive response from the respondent because of its practicality and looks. Before the design process, the flexible solar panel should be in the right size, weight and flexibility to assure that the design are more comfortable to worn by the user. The material that used to produce the jacket and dress are not suitable with the Malaysian climate because of its heavy material and makes it even hotter when wearing it.

## 6. Recommendation

After going through some process of research, design and producing, the researcher believes that the first consideration should be identifying the size and material of the flexible solar panel before engaging to the design development. The researcher also recommends that the research be further more on the material of the solar cell to be combined with fabric. The researcher recommends that before designing process could be done, the engineering element of the size, flexibility, weight and durability of the solar should be test first. The researcher also recommends that this research to be continued for the usage of future technology that will be suitable for Malaysia consumer.

**References**

Angel, Chang. (2005). Engineers are from Mars, Fashion Designers Are from Venus: Bridging the Gap Between Two Opposing Industries. Journal of Wearable Future Conference Hybrid Culture in the Design and Development if Soft Technology. University of Wales, Newport Wales, UK

Lucy, Dunne. (2004). Thesis: The Design of Wearable Technology: Addressing The Human-Device Interface Through Functional Apparel Design. Retrieved 5 July 2012 from http://ecommons.cornell.edu/bitstream/1813/150/2/Lucy%2E%20Dunne-Masters%20Thesis.pdf

Frater, J. (2007). Top 10 Inventions of the Middle Ages. Retrieved November 12 2011from http://listverse.com/2007/09/22/top-10-inventions-of-the-middle-ages/

J. McCann. D. Bryson. (2009). Smarts Clothes and Wearable Technology. Woodhead Publishing

Julia, Gaimster. (2011). Visual Research Methods in Fashion. BERG

Mann, Steve. (1998). Definition of Wearable Computer: Retrieved November 12 2011 from http://wearcomp.org/wearcompdef.html

Marie, O'Mahony. Sarah, E. Braddock. (2002). SPORTSTECH Revolutionary Fabrics, Fashion & Design: Thames & Hudson Ltd.

Quinn, B. (2003). The Fashion of Architecture. BERG

Phyllis, G. Tortora, Keith E. (2005). Survey of Historic Costume: A History of Western Dress. Fourth Edition. Fairchild Publications, Inc New York

Rhodes, B.: A Brief History of Wearable Computing. Retrieved November 12 2011 from http://www.media.mit.edu/wearables/lizzy/timeline.html

Sabine, Seymour. (2008). Fashionable Technology: The Intersection of Design, Fashion, Science and Technology: Springer Wien New York

Sandra, Burke. (2011). FASHION DESIGNER: Concept to Collection. Burke Publishing (ISBN 978-0-9582391-2-7)

Sarah, E. Braddock. Marie O'Mahony. (1999). Techno Textiles: Revolutionary Fabrics for Fashion and Design: Thames & Hudson Ltd.

Scully, K. Johnston, C.D (2012). Colour Forecasting for Fashion. Laurence King Publishing (ISBN: 978 1 85669 880 1)

Susan, B. Kaiser. (1998). The Social Psychology of Clothing: Symbolic Appearances in Context: Fairchild Publications New York

Suzanne, Lee. (2005). Fashioning the Future: Tomorrow's Wardrobe. Thames & Hudson

Zaccagnini, F. J, M. I. Irene. (2009). Research Methods for the Fashion Industry. Fairchild Books N.Y (ISBN: 978 1 56367 633 8)

Zemke, Raines, Filipczak. (2013). Generation at Work: Managing The Clash of Boomers, Gen Xers, Gen Yers in the Workplace. AMACOM (ISBN 978-0-9582391-2-7)