

The Innovative Product Design of a Wristband with a Lulling Babies to Sleep and Body Temperature Detection

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Abstract

The age of low birth rate has come. Babies, male or female, are very precious in almost every family. Although care takers are doing their best to take good care of babies, when babies have a fever or catch a cold, there is still a problem of not being able to know their body temperatures every minute. This study proposed an innovative product design of a product with the functions of lulling babies to sleep and body temperature detection. The design, including a heat detection module in the wristband, a luminous component, and a player, can continuously take users' body temperature. The Velcro belt of the wristband is made of a soft and non-toxic material. When a baby wears the wristband on his wrist, the wristband can lull him to sleep through a lullaby. When the baby's body temperature is lower than the default value, 37.5 degrees, it illuminates blue, indicating that the baby has no fever. And if the baby's body temperature goes over 37.5 degrees, in other words, he has a fever, the wristband flashes red with a voice continuously reporting the current body temperature until the situation is handled. This warning function can help achieve the goal of health care, and care takers' pressure can be released.

Keywords: Body temperature detection, Lulling device, Health care.

1. Introduction

Taiwan is in the face of a society of low birth rate. Babies, male or female, are very precious in almost every family. However, although care takers are doing their best to take good care of babies, when babies have a fever or catch a cold, they have to take babies' body temperatures every once in a while to know babies' conditions so that they can take necessary measures. In these cases, care takers are tensed psychologically and tired physically due to repetitions of movements of getting up to take babies' body temperatures all night. And if babies' fevers last for days and care takers are under pressure from day jobs, they are often exhausted. General thermometers and ear thermometers available in the market can hardly be used to take body temperatures for a long time. This situation needs to be improved.

The soft wristband with a body temperature detection device developed by this study can be worn on a baby's wrist. If the baby's body temperature is normal, the wristband illuminates blue. And there is also a lullaby function available to lull the baby to sleep. If the baby's body temperature is over 37.5 degrees, the wristband flashes red and continuously reports the current body temperature of the baby until the situation is handled. One of the features of this innovative product is to resolve the issue of babies having a fever in the middle of

the night when no one can provide immediate care. Secondly, Babies' fevers may last for days. With proper medication, all their care takers need to do is to keep an eye on the babies' body temperatures and offer necessary help. With the voice device reporting current body temperature, care takers can lie beside babies to take care of them without getting up to check and lying back down over and over. Therefore, care takers can relax and get some rest.

2. Literature Review

Lin selected 340 fever patients as the research subjects and divided them into 2 groups. There were 221 patients in the child group and 119 in the adult group. Their temperatures were taken using ear thermometers. The study explored the differences between temple temperatures and ear temperatures. The results showed that the average ear temperature and temple temperature for children were 38.28°C and 37.81°C , respectively, and 38.33°C and 37.70°C for adults. When having a fever, both children and adults had higher ear temperatures than temple temperatures. And the differences got bigger then the temperatures got higher [1] [11].

Besides brain waves and heart beats, human body temperatures are very significant physiological signals. For the purpose of automatic activation and deactivation, temperature chips can be integrated with portable biomedicine systems to control power switches. The battery activation method can be used to increase portability and convenience [3]. Wang applied the RFID technology to the e-labels with temperature sensors and attached them to students to detect their body temperatures. Through the high-frequency readers installed inside the classrooms, the surveillance systems were designed to notify medical staffs when detecting abnormal body temperatures of students. The troubles of manually taking body temperatures can be saved. And parents don't have to worry about their children in schools. They don't have to be tired running around anymore. The goal of safe campus with good health care can be therefore achieved [2].

Yen used thetmopiles as infrared sensors. The processed output signals were sent to the single chip through Bluetooth, so that patients' body temperature information could be sent to smart phones or PCs. The GUI for information presentation of recorded temperatures was developed using Visual Basic. When the temperature goes outside the normal range, the smart phone could automatically dial an emergency number or send out a warning message to medical staffs to handle the situation [10]. Or this design could be implemented in a system with a micro CPU as the core. With the wireless transfer component, the physiological signal retrieving system and the warning system could be developed. And using non-invasive measuring methods with vibration sensor and condenser microphone and the temperature sensor, babies' sleeping statues and body temperatures could be monitored. The retrieved information could be stored in the database. Therefore, babies' health information could be provided when required. In case of an abnormal physiological condition, a warning signal would be sent out, and the stored information could be provided to doctors for diagnosis purposes [7] [8].

3. Product Development

3.1. Industrial Products

Products can be discussed from the functional aspect and the physical aspect. Product functional elements are single movements and transformation of product functions. Product physical elements are final parts, components, and modules used to make product functions work. Product variety is the range of product designs or styles an enterprise can complete in a specific period of time in response to market demands. Designs of products with module structures can be altered at will without increasing system complexity. As for component standardization, when the same components or blocks are used in complex products, if the blocks are used to execute one or few general functional elements, the blocks should be standardized so that they can be used in different products [12].

Product performance is defined as the degree of expected product functions being executed. Typical properties of product performances include speed, efficiency, life, accuracy, and noise. Integrated structures are helpful for optimization of product performance properties. And performances related to product sizes, shapes, and mass can be improved. The influences of product structures on follow-up product development and final product manufacturing and marketing are very strong. Development teams should integrate capabilities from different departments to design product structures. The steps are: (1) creating a sketch design of the product; (2) grouping the elements in the sketch design; (3) creating a skeleton geometric arrangement; and (4) clarifying basic and related interactive relationships [4].

3.2. Product Production and Development

For products, the phase before mass production is the R&D phase. After several tests and evaluations, R&D and design are required in various phases during the progress. Engineering and technical departments need to perform strict reviews and quality assessments. Production plans are decided by the production control department based on the product types, models, quantities, quality, and delivery dates from the sales orders. Production plans can be categorized into: (1) long-term plans: 3~5 year plans in which production quantities and required production equipment, important parts, and manpower, deadlines of new product development, and plans of plant expansion or increasing production lines are determined based on enterprise's operational strategies and goals; (2) annual plans: plans specifying seasonal/monthly production quantities for all products in a year based on enterprise's annual sales goals, production budgets, material purchases required, production personnel to be hired, and funds and equipment to be prepared; and (3) short-term plans: plans arranging monthly/weekly productions so that required quantities can be met before deadlines for delivery [13].

The main reasons for developing new products include: (1) market demands: consumers may have different needs and values in product security, functions, and prices due to changes of life styles or increasing living standards, and therefore new products or services are required; (2) technology advancement: new materials, new supplies, new parts, and new manufacturing methods allow enterprises to provide better products; (3) competitions:

under pressure of competitions, enterprises are forced to develop new products to maintain or increase their market shares; (4) pursuit of profits: enterprises must develop new products in order to increase their profits; and (5) product life cycles: every product has to go through growth stage, mature stage, and decline stage. There are no products which can live forever. New products must be developed as new coping strategies [6].

3.3. Product Strategy

Product strategies are based on product differences. The premise of development is customers' demands. By learning customers' viewpoints on products, unsatisfied demands of the target customers can be found as a reference for developing new products and providing attractive product mixes with good competitiveness. Before making any product strategies, it is important to understand product categories. Generally, products can be categorized into (1) convenience goods: products of not very high prices which can be purchased by consumers everywhere, such as staples, impulse goods, and emergency goods; (2) shopping goods: products sold through fewer stores, providing in-depth sales consulting services and suggestions to help customers make comparisons and guide them to make advantageous purchase decisions; (3) specialty goods: products bought by loyal customers who would go to retail stores just to buy these products; and (4) unsought goods: products which customers are not interested in and wouldn't actively search for them [9].

Contents of product strategies are about how to create outstanding product values. A challenge which cannot be avoided for marketing is to satisfy customers. Product property include: (1) product quality: products capabilities in execution of their functions, such as endurance, reliability, and accuracy; (2) product features: different products should have different features; (3) product styles and designs: products are made unique with these properties and therefore customer values can be efficiently increased. The innovation process of a new product include: (1) awareness: making consumers aware of the innovative product; (2) interest: stimulating consumers to look for information related to the innovative product; (3) evaluation: making consumers analyze the information they retrieved to decide whether to try it or not; (4) trial: providing trials to consumers so that they can learn more about the values of the product; and (5) adoption: consumers deciding to use the innovative product regularly, which is the ultimate goal of marketing [5].

4. Design Results

The unique features of the innovative product designed by this study is the Velcro belt for easy wearing and the luminous surface of the wristband which make it easy to find the wristband at night. Inside the wristband there is a circuit board electrically connected to the CPU and the heat sensor module. The CPU is connected to the luminous component and the player, so that the power is connected to the CPU, the heat sensor module, the luminous component, and the player to provide them necessary power. The circuit board is connected to the switch. By pressing the switch, the player can be activated and play a lullaby to lull baby to sleep.

When the heat sensor module contacts human skin, it can take body temperature and send the information to the CPU. When the CPU receives the information of a body temperature

less than 37.5 degrees, the wristband illuminates blue; otherwise it triggers the luminous component so that the wristband flashes red and activates the player to send out voice warning to the care taker. This way the care taker can find out about the baby's fever and handle the situation immediately without wasting any precious time. The utility model patent for this innovative product has been approved by the TIPO, with the patent number of M 444069 and the patent duration of 2013/1/1-2022/7/23.

5. Conclusions

The innovative product of the wristband with the lulling function and the body temperature sensor can play a lullaby to lull baby into sleep and can be worn on the baby's wrist to monitor the baby's body temperature changes. Especially, when the baby catches a cold or has a fever, the product can send out voice warning and report body temperatures, not only improve the quality of baby healthcare, but also release care takers' physical and mental pressures.

5.1. Discussions

(1) Children's care: This innovative product was designed based on the idea of children's care. It was designed to improve the quality of home care and build a healthy environment. With the starting point of humane and social care, consideration of users' demands, and simulations of possible scenarios, this study proposed the temperature sensor wristband design, to help care takers continuously monitor babies' body temperature and reduce tragedies caused by human errors which can be avoided.

(2) Healthy and safe environment: Body temperature changes are signs of body discomfort. How to monitor children's body temperatures is an important issue for care takers. However, at late night it is difficult for care takers to get up all the time to check on children. If children have a sudden fever during sleep, not being able to handle immediately may lead to some tragedies which none of us would like to see. Therefore, this study proposed the newly designed product, in hopes of creating a healthy and safe environment where care takers can monitor children's body temperatures any time without physical and mental pressure.

(3) Market potential: The age of low birth rate has come. Children are very precious in every family. How to offer them more complete care has become an important issue. This innovative product was designed to continuously monitor children's body temperatures and send out warning messages in time. It can definitely meet the market demands. And in the future, through discussions and cooperation with medical equipment manufacturers, higher market potential can be created.

(4) Plan for mass production: If further cooperation with a manufacturer is possible for this innovative product design, mass production can be planned to lower manufacturing costs, benefiting more families.

5.2. Suggestions

(1) Practicing ideas: When a good and innovative idea comes up, it should be recorded right away. Otherwise it may be forgotten in a moment. Furthermore, corresponding solutions or

strategies should also be written down as a basis for follow-up product R&D, to accumulate innovative design experiences and offer manufacturers a reference for production.

(2) Patent application: If an idea is good and innovative, it is suggested to apply for a patent for the idea, as a protection for follow-up product development and manufacturing. However, before submitting the patent application, it is necessary to perform a patent search to find out if there is any similar idea, in order to avoid unnecessary law suits in the future.

(3) Participating in exhibitions and competitions: Once an innovative product design is patented, it is suggested to aggressively participate in domestic and foreign exhibitions and competitions to increase chances of exposure, so that innovative inventions from Taiwan can be known by the world.

(4) Technology transfer: The ultimate goals of a good innovative product design are mass production and sales. Therefore, it is suggested that the academia can work with the industries more often. Through cooperation, operators' willingness to purchase patent rights may be increased. This way, innovative ideas of products can be carried out and mass productions become possible, and the ultimate goal of successful technology transfer can be achieved.

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