

# Communication and Technology into Product Design

Implementation of Craft Design to Modern Jewelry as an Awareness Product

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**Abstract.** As social beings, human need interaction to meet their needs in terms of carrying out their lives in daily activities. Human who tends to be individualistic makes the existing sense of empathy eroded, especially in the modern as today. No matter how individualistic a person is, there will be times when humans need help or assistance from others. For example, when someone is experiencing an urgent medical experience or when a crime is being committed. Sometimes, many communication barriers regarding asking for help in these situations. This study is a pilot project that tries to create a jewelry product that has additional functions as a means of communication to ask for help from people around and provide medical information for the emergency needs of the disease suffered by the user of the product. The features developed are jewelry products with designs that can be used to make sounds as a signal to ask for help and the provision of medical information that can be accessed via a QR code that can be scanned using a smartphone device. The method uses a behavioral observation approach and design thinking methodology for the design process. The study and testing of product prototypes show that the sound signal generated from the jewelry product can attract the attention of people around the user and easier to hear. The QR code can be accessed and provide medical information from smartphone devices through the Revive application (mobile or desktop).

**Keywords:** *Wearable Device, Medical Information, Communication.*

## 1. Introduction

Emergency situations can happen to anyone and anywhere. Crisis and catastrophes are included as natural disaster, social and economic adversity, political situations, as well as public health issues. Based on ready.gov and Weston.org sites, matters that are considered as urgent situations are snowstorm, chemical spillage, dam failure, droughts, earthquake, severe weather, fire, floods, hurricanes, child kidnapping and death, family members with Alzheimer disease, pandemics, local rabies situation, terrorist attacks, thunderstorms, medical emergencies, and tornadoes [1].

In 2014, there are 196 reported cases to Indonesian National Administration of Children's Safety, which includes forty-five cases of child abduction, and 15 cases of missing children [2]. 618 cases of missing elderly caused by dementia in Surabaya were reported through January 2017 to July 2019 [3]. Additionally, there are numerous data retained from the urgent cases that were reported to Indonesia's National Commission Against Woman Violence in 2021. There are 1,731 reported public violence [4] that happened toward women in 2021, whereas there are seventy-seven reported cases of woman with physical and intellectual disabilities in 2020 [4]. There are also a rise of reported children missing in 2014. Other urgent cases similar to being exposed to a particular disease outbreak or animal zoonotic disease, missing person case during natural disaster or being under a terrifying situation can happen to anyone at any part of the world in anytime.

Communication is an essential part of each individual to inform their thoughts. In the case of emergency, communication is a vital and can be done with verbal, non-verbal, writings, noise, and visuals [5]. Noise travels through wave and amplifies when it touches surrounding object to give out information. When we are unable to look at our surrounding, there is no one to talk to, noises can be an effective alternative way to help us in conveying information to the surrounding area. Making a whine, hoarse noise, and sniffing noise are one of the ways of social communication to give away emergency signal. This method of communication is utilized to transfer emotion without verbal communication.

The previous statement stated that communication serves as a link. In the present day, information technology is essential, including connectivity as an element of the IoT ecosystem [6]. The range of sound waves has limitations and creates movement that needs to be seen by possible relief agents. It was necessary to have a digital technology application that functions to serve information, namely a QR code, as shown in Figure 1 for the intended user. The use of QR codes as a provider of information about public health history is commonly applied to hospital patients [7]. QR code may provide information about the patient's medical history, pre-existing illnesses or allergies, medical conditions, types of medications prescribed by the hospital, and other details [8]. This digital technology facilitates the shift of communication interactions that are limited by time and environment into unlimited communication patterns. With the absolute continuity of information that can be accessed and broadcast through digital media, emergencies can be handled or responded to with an immediate approach.

A product that serves as a daily wear and attaches to the body like jewelry, can be used as an option to operate as **wearable device**. Not only being worn as a jewelry, but **the device** can also be worn as a method of communication by sending emergency signal and as a media of communication through a digital device such as a smartphone. **This communication device** hopes to resolve urgent and emergency situations, such as medical emergency, prevent crime, and other urgent conditions through vocal communication and digitally accessed information. The benefit of using jewelry as communication device is the device always attach to the user's body. Many of safety wearable devices today have major disadvantage where they can easily fall because they are not wearable device for the user [9].



Fig. 1 QR Code sample

## 2. Methodology

This research begins with the observation to collect data on the needs of product users. Furthermore, using the Design Thinking methodology [10] for the design process. The first step is to conduct an empathy study by observing the information needed in an emergency. The observations describe the problems obtained from the victim and those closest persons. The next stage is to process the findings from the study of empathy and existing trials into several creative and innovative ideas through the steps of the design process based on user needs, behavior, and usage. The study phase continued with the implementation of the solution through the manufacture of jewelry prototypes made of Silver material. QR code creation on the product surface using laser engraving technology. The QR code scan presents the simple interface of the Revive application on the smartphone screen. The finished prototype was tested in terms of user behavior and operational devices. The trial's final results will find several things that need to be reviewed for future improvements.

## 3. Result & Discussion

This research is divided into several parts, namely users, objects as solutions and technology-based information media. This process involves a consumer of a jewelry company CV. Adhiluhung Kausa Anugerah Laksmi (CV AKAL) located in Pondok Aren Tangerang Selatan, Craftsmen and team from Revive who play a role in terms of IT and User Experience. These stages are described as follows:

- a. Empathy Studies. The empathy studies conducted were aimed at 2 different personas, namely from the side of the victim (person A) with a disguised name, where this person has auto-immunity that can weaken this person's body if the disease recurs and also from the side of the person who receives an emergency signal or finds the victim is suffering from a relapse. is in an emergency condition (person B). The things studied can be seen in the following table:

**Table 1.** Empathy study output

No	Variabel	Person A	Person B
1	Actions to take in an emergency	Asking for help from those around us	Contacting the help center
2	How to ask for help	Scream in the hope that someone will hear; contact close relatives	Call; seek help in the nearest area
3	Tools you have to ask for help	Smartphone; medical jewelry	Smartphone
4	When an emergency occurs, you don't have time to ask for help, what to expect	Helpers look at the marks on the medical jewelry that is used; helper Find out my identity in the hope that it can be used as a reference to ask for help from the appropriate party.	-
5	What to do when you find a victim who hasn't had time to ask for help	-	Seek help in the nearest area; contact the help center; look for the cellphone/identity attached to the victim.

- b. Define. In the victim's position, it was conveyed that there was a need for an alert system to give a signal to their surroundings if they were in an emergency and if they did not have time to ask for help, an easy and effective information system was needed. Then from the side of people who get an emergency signal or find a victim who is in an emergency condition, they argue that basic information is needed from the victim in the form of a telephone number of a person who can be contacted and data on the main illness suffered.
- c. Ideate. From the results of behavioral observations made to users, objects that can be used as a means to provide warning signals and information are jewelry in the form of necklaces. Based on the body location as seen on figure 2, the placement of jewelry on the neck is much easier for the victim to use, easy for the rescuer to see and easy to reach by hand when carrying out its function as a signaler. In order for this jewelry to produce a resonant sound, a hollow or volume shape is required. The shape used is a cylinder where the struc-

ture of the inner surface forms a hollow. Surfaces with a concave plane can reflect sound waves that point in one direction [11], the reflection can be seen in figure 3. Emergency conditions require quick handling as well. Judging from this need, the information media that is easily accessible and its existence is quite familiar is the QR Code which can be scanned using a smartphone as in figure 4 and will later be connected to an application on the smartphone. The application contains basic information such as telephone numbers that can be contacted, a description of the illness suffered, the telephone number of the referral hospital that the victim usually visits. From the basic information contained in the application, it is hoped that it can provide a way out for further actions. To be able to print the QR Code and to make it easy to read, we need a media with a flat surface with a design that can be adjusted to its aesthetic value. Based on this analysis, the jewelry that is applied as a communication medium is a cylindrical necklace like the one in the design process in figure 5. This necklace has a pendulum in the form of a whistle that is used by blowing it and has a flat plate as an information medium that can be accessed via QR Code.

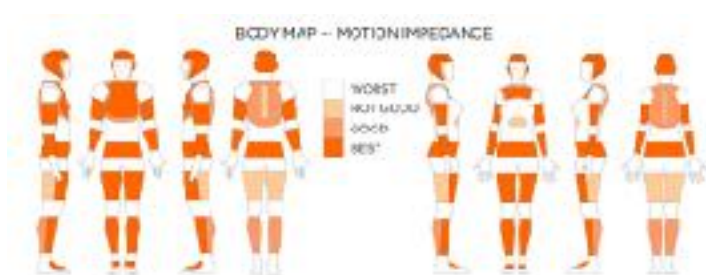


Fig. 2 Body-map motion impedance

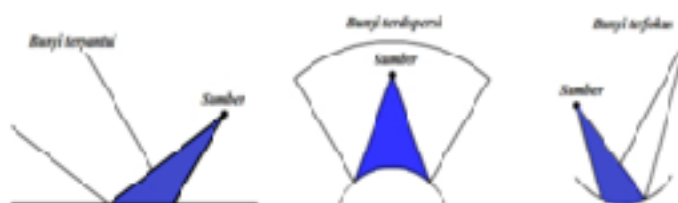


Fig. 3 Reflection of sound through the curved surface

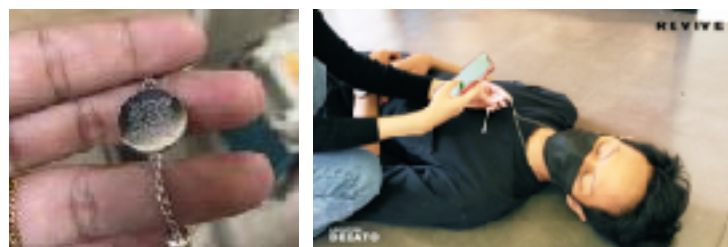
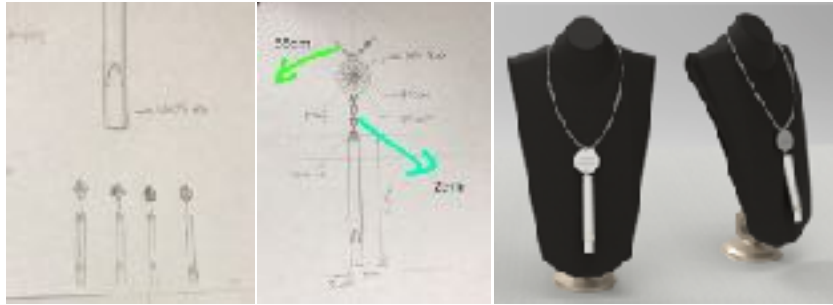


Fig. 4 QR code on the silver plate and QR scan process



**Fig. 5** Sketch and 3D drawing

- d. Prototype. After getting a design that is adapted to the stages mentioned above, then a prototyping design is carried out with 2 different sizes with target users, namely men and women. Materials that has a solid (not porous and not perforated), hard and flat surface reflects almost all of the sound energy [12]. The material used is silver with a concentration of 92.5% and has 1.1 millimetre's of thickness, which is more than 5% of the tube diameter [12]. This necklace has 3 parts, namely a chain to attach to the human body, a flat plate for information media based on QR Code technology and a whistle with a cylindrical shape. The fabrication process carried out is the manufacture of silver metal plates and whistles. The initial step in this process is to make a metal plate into a cylinder as shown in figure 6a. Then proceed with plate making, with the front side being engraved to add aesthetic value to the jewelry and the back side being plain as a medium for placing the QR Code. The chain used will use a chain that is already available in the market. The next step is the installation of decorative elements in the form of cubic zirconia stones at several points, figure 6b. After that the stage of printing the QR Code using the laser engraving method. The last stage is the polishing and plating process using chrome and yellow colored rhodium liquid, or in Indonesia



(a)



(b)

**Fig. 6** Fabrication and stone setting process



it is commonly referred to as white gold and yellow gold. Necklace jewelry ready for trial, figure 7.

**Fig. 7** Final prototype

Next, make a prototype user experience that is on a smartphone application. We decided to create high fidelity prototype. The high fidelity prototypes have great visuals that able to show the idea to others [13]. To enter the stage of making UX Design, you need a UX mapping. This



stage is far from perfect, and will continue to develop in the future. Figure 8 below is a display of the results of the UX Design which is still temporary.

**Figure 8** UX Design for Revive Application's plan

e. Test. The trial process was carried out to measure the following five variables:

**Table 2.** Test result

No.	Variabel	Result
1	Whistle can work	The whistle made a sound
2	Sound volume	Men's necklace: the result of the sound has a heavier tone of voice (low pitch). Women's necklace: the result of the sound has a higher tone of voice (high pitch).
3	Sound coverage radius	Women's necklaces can be reached well up to an average radius of 8 meters.
4	Information system via QR Code can be detected by HP camera	QR code can be detected easily by cell-phone camera.
5	UX Design on Apps	For starters there are still some parts that need to be shown on the page in more detail, for example when tapping on Medical Record.
6	necklace weight	Men's necklace: a bit heavier than women's Women's necklaces: their weight is still within the tolerance limit category (appropriate).
7	Finishing resistance (rhodium plating on silver)	The color change in the oxidation process of necklaces that use yellow gold is faster than those of white gold.

Basically, this necklace can carry out its function, it's just that the test is carried out when the surrounding environment is not crowded, so that the whistle is not so distracted from other sounds around it. More testing is needed when it's in a more crowded situation. The volume produced on a necklace with a small diameter (necklace for women) is easier to hear than on a necklace with a larger diameter (necklace for men). The range of sound on men's necklaces needs to be reviewed in order to function optimally. By detecting the QR code on the silver metal surface, it means that the information system at this early stage is running well, it's just that the UX Design needs to be mapped further. The weight of a men's necklace is also determined from the overall material used, in this case the lighter chain necklace should be chosen. The final layer which is easy to change due to the oxidation process needs to be explored again from the side of the coating process or from the use of other chemicals, whether it needs to be added or replaced with other chemicals.



## 4. Conclusion

Jewelry with a cylindrical shape that produces sound and has an IoT-based information system in the form of a QR Code is a combination of metal-based jewelry crafts and technology as a communication medium to convey emergency signals. The final result of this trial reached approximately 80% of the target at the initial research stage. The benefits are quite positive, because it can be used as a medical alert only, but it can also be useful as an awareness product, for example for women as crime prevention, for children and the elderly as a communication aid during an emergency. This research can still be developed more widely. The next plan, apart from improving the results of the initial trial, also tries to test the market demand for this product with a simple application that is already running.

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