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**Reduce Women Sexual Violence Smartly  
Through Technology**

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**OSLOMET**

## Preface

This thesis is the final work of my Master's study at Oslo Metropolitan University in Universal Design of ICT. It presents as a documentation of my research work that has been done during my study period. The topic has been chosen for this thesis is all about how to make sure women's safety and security through a smart technology. Harassment, sexual violence or abuses are major concerns for women; either they go outside for work or stay at home. This has been one of the crucial facts that women are facing, especially who are living in developing countries. So, having an affordable sensor based wristband can solve the problem. This paper provides all research work and development that have been done to implement the proposed digital solution.

Through the journey of this thesis work, there were a lot of challenges which helped me to learn a lot and gave me intense knowledge about universal design of ICT. I also got the opportunity to explore new country, while doing my thesis field work in Mozambique. I got to know more about my capability while doing development for my thesis as I have never done any hardware development before, working with wires, boards, sensors were difficult but fun. I want to thank everyone in Mozambique who helped a lot for completing the field work and it taught me that only providing a digital solution is not enough, if the country faces lot of social issues. And the end result of this field work was unexpected yet worthy enough to continue this research work in future to provide a better solution.

Finally, I would like to thank my supervisors Terje Gjørseter and George Anthony Giannoumis, who have been amazing supportive throughout this thesis work, without their proper guidance and their encouragement, this work would have not been possible. I also want to thank my university and all other professors of my Master's courses who gave all the required lessons for this Master's program and I want to thank my departmental head Norun Christine Sanderson for providing always all kind of supports.

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## Abstract

In recent years, acts of sexual violence against women are increasing at a terrifying rate (Mahajan, Reddy, & Rajput, 2016). United Nations says sexual violence includes a host of harmful behaviors directed at women and girls because of their sex, including wife abuse, sexual assault, dowry related murder, marital rape, selective malnourishment of female children, forced prostitution, female genital mutilation, and sexual abuse of female children (Ellsberg & Heise, 2005). Research conducts and collected data suggest that in some countries nearly one in four women experience sexual violence (Jewkes, Sen, & Garcia-Moreno, 2002). Sexual violence has a profound impact on physical and mental health. However, research has yet to fully investigate to this sexual violence problem and tried to reduce it smartly using technology (Mahajan et al., 2016). This project aims to research on existing works for women security, against women harassment and to develop a smart wristband which can be affordable and effective to protect women from sexual violence. In order to investigate about reducing sexual violence this paper asks to develop a smart system and use qualitative research method. This paper uses data to empirically investigate how to reduce sexual violence against women. And the investigation also turns out that only giving any smart technical solution to reduce sexual violence for any developing countries is not enough until the country is providing women proper access to information technology. Research of this paper shows gender discrimination is playing a huge role in developing countries like Mozambique, because of that most of the women do not have access to technologies. So, this project also aims to provide possible solution for women to have better access to technology through the data that collected in Mozambique while doing field work.

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## Introduction

In the current global scenario, one of the most serious issues for women is security and safety. Sexual harassment, domestic violence and abuse; these problems have become major concern especially in low income countries like in Asia, Africa. Most of the girls and women worry about their safety; they are looking for the day when they will be able to move freely on the streets without worrying about their security even in odd hours. Regarding on women safety, several mobile applications have been developed in recent years (Mahmud et al., 2017). A smart foot device has been also developed for women security (N. Viswanath, Pakyala, & Muneeswari, 2016). But the question is “will it be effective and usable for people with disabilities? And also for people in developing countries, where information technology is not that much accessible and who are not that much literate to use any digital system? “These existing research findings can be a good solution to the people in some countries where technology is taking another level of country’s development but these are not universally accessible, especially for women who have less knowledge about technologies and deprived from lot of facilities because of gender gap in developing countries.

This paper focuses on some existing works in previous years for women safety and discusses proposed solution for women in low income countries. Besides discussing about existing works and proposed solution, this paper also has done investigations in Mozambique and learnt how to make information technology more accessible for women in developing countries, where some of them are not even educated and don’t know how to use smartphones. “Mozambique is one of the least-developed countries (UNDP/HDI ranking 2011: 184 out of 187) with a 2007 population estimate of 23,929,700 inhabitants in 2012.” Seventy one percent of the population live in rural areas and fifty two percent are illiterate (Muianga et al., 2013). Research in Mozambique also shows that poverty and illiteracy are one of the most crucial reasons for this country not having technology that much accessible, also gender discrimination is another reason for women to be so behind from technology. And not having proper knowledge about sexual violence, even though women facing it, it has never been reported or shared, it was always a hidden factor for this country (Romão, Mabunda, Buque, Samo, & Barca, 2007). This paper also discusses all

possible solutions for these challenges and how the proposed system will be very effective for women in developing countries like Mozambique while having these social challenges. There is some research questions have been made for this thesis:-

- 1) "How can this proposed system for women safety be accessible for developing countries where information technology is still not much accessible?"
- 2) "How will this proposed system help women who are illiterate?"
- 3) "Will this proposed system help women with disabilities?"

If any smart wristband can be developed which will automatically connect to a mobile application and in the application there will be one option which will work as a trigger button, in this application there is a feature to register emergency contacts and while the button will be triggered it will send a message saying the user needs help and also will give current location, so that someone from emergency contacts can come and help. There will also be a siren button, so that it can help the user instantly until someone comes and help her. It will operate through multiple sensors and directly will connect to application, then it can be a smart and immediate solution for women during dangerous situations, also it will be workable for people with (Akash, Al-Zihad, Adhikary, Razzaque, & Sharmin, 2016). At first, this thesis reviews the relevant existing works in reducing women sexual harassment, current situations of Information technology and all social challenges that have been found in Mozambique, as this thesis focused on Mozambique-Norway accessibility project. It also discusses about how information communication and technology can be more accessible in Mozambique, especially for women who facing gender discrimination and illiteracy. Besides that, some development has been done for the proposed system. As initial stage, this thesis focuses on basic development, the device is controlled through temperature sensor and will trigger the mobile app when the sensor will cross the highest limit and send location, call the person so that they know the victim in danger.



## Literature Review

Researchers have worked on sexual harassment previously and there are lots of definitions about it. In this paper what UN, WHO has researched about sexual harassment will be described. Besides talking about harassment, there are some research about existing works and some smart devices that have been developed to reduce sexual harassment; these will also be described here. Alongside, this master's thesis is also focused on women in Mozambique, so it's important to discuss about current situation of sexual harassment and technology accessibility in Mozambique and in Africa.

### Violence

The World Health Organization (WHO) defines sexual violence as any kind of sexual attempt to attain a sexual act, unwanted sexual advances, or directed against a person's sexuality using constraint, by any person regardless of their relationship to the victim, in any setting, which is not limited to home and work (Organization, 2014). Sexual harassment can also occur when someone is not able to give consent – for example, while intoxicated, drugged, and asleep or women with disabilities (Organization, 2012). At the same time WHO says some definitions of sexual harassment are limited to those acts that involve force or the threat of physical violence.

The WHO multi-country study (García-Moreno & Organization, 2005) defined sexual harassment is an act through which woman is physically forced to have sexual intercourse without her consent.

UN defines the term “violence against women” as an act of gender-based violence that results physically, sexually or psychologically harmful or suffering to women, including threats of such attempts, obligations or arbitrary deprivation of liberty, whether occurring in public or private life (Ellsberg & Heise, 2005). Accordingly, violence against women encompasses but is not limited to the following:

“a) The violence which occurs physically, sexually and psychologically in the family, also including sexual abuse of female children in the household, dowry-related issues, marital rape, female genital mutilation and other traditional practices harmful to women and violence related to exploitation;

b) Physical, sexual and psychological violence occurring within the general community, including rape, sexual abuse, sexual harassment and intimidation at work, in educational institutions and elsewhere, trafficking in women and forced prostitution;

c) Physical, sexual and psychological violence perpetrated or condoned by the State, wherever it occurs. Acts of violence against women also include forced disinfection and forced abortion, female infanticide and prenatal sex selection (From United Nations, 1993).”

Also United States described the concept of sexual harassment in workplace as a legal concept which studied by social and behavioral scientists (Schneider, Pryor, & Fitzgerald, 2010). In the US, workplace sexual harassment is considered a form of gender-based discrimination under Federal Law. In 1980, a set of guidelines that have become the cornerstone of legal and policy definitions of sexual violence throughout the United States was issued by the US Equal Employment Opportunity Commission (Schneider et al., 2010). These guidelines describe two general types of sexual harassment:

- (1) unwelcome sex or gender-related behavior that creates a hostile environment and
- (2) quid pro quo behaviors, where the unwelcome behavior becomes a term or condition of employment or advancement.

The EEOC Guidelines emphasize the importance of examining the specifics of each case in determining whether sexual harassment has taken place. This point seems to acknowledge the importance of contextual factors in judging whether behaviors should be considered to be sexually harassing.

These definitions from WHO, UN, United States prove that women sexual violence has become a common problem all over the world. To reduce this issue many mobile applications and smart device have been developed, though these systems have not been used in real life.

## **Existing systems**

### **Smart Foot Device**

On 2016 one research group attempted a step to develop a smart foot device. This smart device would be clipped to the footwear of the user and could be triggered discreetly (N.

Viswanath et al., 2016). When one foot behind the other is tapped four times, an alert is sent via Bluetooth Low Energy communication to an application on the victim's phone, which is programmed to send a message seeking help with the location of the device attached. The first step is the clipping of the device to the footwear of the user (N. Viswanath et al., 2016). The next step is the establishment of Bluetooth connection between the device and the user's Smartphone. The device must be paired with the user's Smartphone to work in conjunction with the application. Hence, no unauthorized user can connect to the device. Since BLE (Bluetooth Low Energy) is being used, the phone can be connected to the device without much loss in the battery life (Liu, Chen, Ma, & Xu, 2013). The acceleration sensor present on the device will record the acceleration reading in x, y and z axes once every second. When the user taps her left foot from the back using the right foot, the accelerometer senses a change in the reading in the z axis and an alert is sent to trigger the user's phone via BLE connection. When consecutive taps are detected, an alert is sent to the user's smartphone via the established BLE Connection. On receiving the alert from the device, an application on the smartphone is programmed to send its location to four contacts that the user can preset on the application. The application can further be programmed to inform authorities (Liu et al., 2013).

This work was aimed at developing a smart low-cost device to help women feel safer and prevent the occurrence of rape, harassment and other dangerous situations. The design is developed using an Arduino microcontroller with a tri-axial accelerometer and a Bluetooth Low Energy module embedded in it. This device is clipped to the footwear of the user. The automated system gave a high accuracy of 100% in the tapping scenario and 95% in the walking scenario. This study has a few limitations such as the trigger of a false alarm if the user taps her foot from the back involuntarily. The device works well only in scenarios where the user's feet are at ground level. By working on more number of scenarios and with sufficient collection of data (subjects with different age group, gender, and height), the reliability and robustness of the system can be improved.

### **Hear Me**

In 2016 some researchers worked on a smart mobile application, called HearMe, that enhances the user experience by introducing tap based emergency contact with the family person(s) through sending short message/phone call, generating alarm at the destination

device and setting scheduled communications (Akash et al., 2016). Sexual violence against women has become one of the most important social security problems in South Asian region. None of the existing humanitarian mobile applications exactly contains the features that a victim needs in times of danger or immediately after being victimized. In this paper, we develop a smart mobile application, namely HearMe, with multiple unique features including lock screen access and instant siren on the receiver device. In order to provide quick access to the victim woman, some modules of "HearMe" application can be got through hardware buttons. Another important feature of HearMe is to blow a loud siren at the receiver device even if the mobile is in silent mode, increasing the reliability of getting help from the family members or hospital V police station personnel.

### **Watch Me**

According to the current global scenario, in 2017 some researchers introduced a technology named "Watch Me", (Helen, Fathila, Rijwana, & Kalaiselvi, 2017) when a women or child wearing this 'watch me' is exposed to sexual or vulnerable attack, the sensor present in it detects the heart beat rate of a person which will be high at the moment by the secretion of epinephrine hormone from hpa axis and gets activated, this will not only provide a alarm sound to the attention of nearby people, it will automatically make an call to our registered contact and also through GPS/GSM it will detect the nearby police station and make an ring there so it will be helpful for police to arrive soon at the spot by tracking the GPS , such a system will lead to safer and better environment. The smart watch is chosen for its portability and cost effective components, as the technology grew people nowadays prefer smart watches to wear for many technical purpose and good stylish look. The battery can be changed by replacing with new one. The battery used in watch is Lithium batteries (Li-ion polymer battery). This type of battery is used because they are easily rechargeable and occupy less space and cost efficient.

### **Abhaya**

In 2015 some researchers proposed a system called "ABHAYA", (Yarrabothu & Thota, 2015) to develop this system for android users for keeping track through several applications. This application uses GPS for identifying the location of the person in trouble and the system can be divided into two modules:

1. First module can be the victim's phone i.e the root device which uses 3G/2G data connection for tracking the location of the victim through GPS.
2. Second module can be the mobile phone of registered contacts, the contacts can be either police or friends or family members, who receives the message containing the link of the location of victim that is sent from the root device (Yarrabothu & Thota, 2015).

Initially, when a person clicks on the app, it first checks whether the location settings, data connection settings in the application are on or not. Then, it tracks the location of the victim via GPS and sends these location co-ordinates in the form of URL through message to the registered contacts. Here, registered contacts means the contact details that are saved in the Abhaya application during its initialization. Now, at the received device, by clicking on the URL in the message, it spots the exact location of the victim. Also, as the message containing victim's location is sent for every five minutes from the root device, the victim can be tracked wherever she goes and can be rescued safely and quickly (Yarrabothu & Thota, 2015).

### **Others**

There are some existing apps such as 'Hollaback' (Dimond, Dye, LaRose, & Bruckman, 2013), 'MoveFree' (Roy, Sharma, & Bhattacharya, 2015), MehfoozAurat (Sarosh, Yousaf, Javed, & Shahid, 2016). MoveFree contains general database with Names and health related attributes. It also contains police station database with hospital locations in West Bangal, India. However, it is mentioned that the wearable sensor band has not yet been developed as the prototype for real time monitoring health data for women. The MehfoozAurat intends to show safe routes within Lahore, Pakistan (Sarosh et al., 2016). Another application named 'SafetiPin' (K. Viswanath & Basu, 2015) focused on depicting the safe travel routes based on crowd sourcing, which again doesn't ensure the reliable feedbacks (K. Viswanath & Basu, 2015). The criminals can also use the app without verification and misguide women by showing an unsecured route instead of a safe one. Some applications have audio recording facility for victim women. Like recommending a safe route in (K. Viswanath & Basu, 2015) audio recording also can't help a women in danger that much. A panic button was introduced in Hollaback' (Dimond et al., 2013) that produce an alarm at mobile device of the victim so that she can get help from neighbors.

However, very few have actually used the panic button according to multiple surveys. Protibadi (Akshata, Pathan, Patil, & Nadaf, 2014) app emphasizes on adding friends safely and reporting harassment events to administrative authority (Akshata et al., 2014). In a study conducted by Action Aid in 2015, 73% of Bangladeshi parents believed that it is better to have their girls married young rather than face harassment problems, 79.8% parents believe harassment is a problem and 84.5% are scared of it (Women, 2011).

### **Sensors used for security**

#### **Security system for home**

In 2013 one group proposed a system for home security (Bangali & Shaligram, 2013) which was controlled by an Atmega644p microcontroller. It collected information from the sensors and sent SMS to a corresponding number by using a GSM modem. If it found any interruption in its sensors (for example IR sensor) then microcontroller would send a SMS to the home owner. In the same way if the temperature was increased above certain point or gas sensor sensors was ON, a SMS would be sent to the home owner 'Fire at home' giving the indication of fire. The LDR (Light Dependent Resistor) was used to sense the light in a room and accordingly lights would be turn ON or OFF (Bangali & Shaligram, 2013).

#### **Smart girl security**

In 2014 a group of people from Belgium proposed a system to design a portable device like a normal belt (Chougula, Naik, Monu, Patil, & Das, 2014). The system was implemented using Arduino Board, GSM/GPS modules, screaming alarm and pressure sensors. The device will get activated automatically when the limit of pressure sensor would cross (Chougula et al., 2014). After the device activates, the location of the victim (Muggah & Krause, 2009) will be tracked with the help of GPS and emergency messages would be sent to contacts every two minutes with updated location. The screaming alarm unit would be activated and would send out sirens to call out for help. The system was also capable to generate an electric shock to harm the attacker which might help the victim to escape (Chougula et al., 2014).

#### **Smart Bracelet**

This year a group of students from USA designed a Smart Jewelry Bracelet to detect assault (Patel & Hasan, 2018). However, besides assault detection, it can be used for other

purposes as well. They described several usage scenarios in their paper. For auto assault detect if a person was walking and suddenly got assault from behind, then the person would be struggling with the attacker, the smart bracelet would detect of the person's movements as an assault and it triggered the person's phone to call police for help (Patel & Hasan, 2018). It has been researched that information technologies are playing an important role for rural development. However, while many countries such as India, Bangladesh, Africa are investing for development of ICT in their countries, women are somehow being deprived from the rights of using technology. As this master's thesis also focused in Mozambique, here some insights have been discussed about ICT policy in Africa and how most of the women are far away from using technologies.

### **Current state of Information and communication technology in Mozambique**

Mozambique has a very challenging journey ahead because, this country has the full potential in information technology sector for developing its economy and to make progress on the accessibility of information communication technology that can help for the achievement of the United Nations' Sustainable Development Goals (RADEMAN, January 2019). Mozambique's successes include licensing and regulatory achievements in telecommunications, which have stimulated competition and contributed to meeting national policy objectives. Mozambique's economic condition has been developing steadily since the end of civil war in 1992, for example some large infrastructure projects as construction of roads, bridges, airports and railways, besides that the exploitation of mineral and energy resources (Mabila, 2013). "The GDP in 2012 was estimated at USD14.6billion and the GDP per capita at USD579" (Mabila, 2013). Though Mozambique is still one of the poorest countries in the world it has one of the fastest-growing GDP rates on the continent and calculated at 7.25% in 2012. In terms of technology development, Mozambique has been visible to work on some improvement of public and private investment in telecommunications network infrastructure and services. There also have been some policy and regulations are issued to improve the ICT business environment in the country. However there has been no competitor in market sector and that causes inefficiencies in the technology sector and this situation influences directly on the status of all Information technology related indicators, for example: internet penetration, computer literacy, availability of local content, radio and TV broadcasting, and even mobile network

coverage (Mabila, 2013). Due to poor infrastructure, the country has an extremely low fixed-line penetration rate of less than one percent (RADEMAN, January 2019). “With the other least-developed African countries in the 2017 After Access Survey conducted across 16 countries in Global South, Mozambique had among the lowest mobile phone and Internet penetration rates. Rwanda (with 50%) has a higher mobile phone penetration rate than Mozambique (40%), but an even lower Internet penetration rate at nine percent to Mozambique’s ten percent” (RADEMAN, January 2019). In 2002, Mozambique Government’s information policy commission mentioned about the importance and the necessity for developing robust and modern countrywide network system, for boosting the society as digital and informative society in Mozambique ("Secretariado Executivo da Comissão para a Política de Informática,," 2002). Key priorities for development of Information technology in Mozambique included network coverage and replacing old technologies with modern technologies. Research showed that the transmission network and all telephone switches are 100% digitalized.

Though, Mozambique is trying to improve technically and becoming digital but the process of the development progress is not happening actively and this causes the country to be behind from technology than other countries. Higher Education is one of the most important sectors for developing the human capital of countries to support innovation and find new solutions for sustainable and equitable growth. Information technology has been using now everywhere in the world to improve the quality of education by enhancing educational content development, supporting administrative processes in schools and other educational establishments, and increasing access to education for both teachers and students via distance or e-learning.

### **Communication Penetration**

In 2017, there has been a survey conducted across 16 countries in the Global South, and it showed Mozambique had the lowest mobile phone and Internet penetration rates, 30% and 10%, respectively (Chair, Apr 4th, 2019). The mobile operator’s revenue has been declined from 2014 which may be distinguishable to pricing pressure from the third enterer, Movitel, in the saturated voice market. Mobile operators in Mozambique have not transitioned to generating significant revenues from data as they have in more mature mobile data markets.



“The low-cost service strategy adopted by the third entrant, Movitel, helped it to win a significant revenue share, primarily from mCel, gaining about 11 percent in 2012 and subsequently increasing its revenue share to 27 percent in 2016, leaving mCel with only 21 percent of the total mobile revenue” (Chair, Apr 4th, 2019).

Vodacom’s data revenue grew by 31 percent and data customers increased by 63.6 percent, reaching MZN3.7 million, but this is off a very low base and voice revenues remain its dominant source of revenues, unlike in the South Africa market where revenues from data now exceed its voice revenues (Chair, Apr 4th, 2019).

### **ICT in education of Mozambique**

Higher education system of Mozambique has been developing significantly in the last two decades (Muianga et al., 2013). From developing three public universities in 1990, the Higher Education Strategic Plan (2000-2010) with the Law of Higher Education in 1993 opened the higher education sector to private providers. Because of this, 41 more institutions of higher education have been created in Mozambique and currently, Mozambique has 44 institutions including 18 public and 26 private universities in all provinces of the country, with more than 101,300 students in total. That’s why higher education has become one of the priority areas in Mozambican ICT policy (Muianga et al., 2013).

From the latest action plan, one of the most important features was to introduce information technology with an “essential role in preparing and promoting economic growth through innovation” and “in poverty reduction” (UNDP, 2008). The Government of Mozambique recognizes the worldwide impact of information technologies and its important role to reduce poverty. The potential effects of information communication and technology still need to be fully understandable in this country. However, some research critics are still unsure about these capabilities and consider ICT as a luxury, especially by people who are living in poverty (UNDP, 2008). There are arguments about the usefulness and impact of ICT, but all stakeholders agree that education is one of the key factors for the development of a country. Many researchers and international development aid agencies have emphasized education as one of the pillars of development ICT especially for developing countries by increasing access and improving the quality of technology in education (Muianga et al., 2013). In order to make ICT accessible and useful for larger

amount of the population, the government launched “the Mozambique ICT Policy” in 2000. The next “Technique for Innovation in Science and Technology in Mozambique” was initiated in 2002. This technique delivers policy rights and strategies to encourage research, human resource development and knowledge transformation, as part of national poverty reduction offers (Muianga et al., 2013). In 2000, Mozambique’s government approved a national ICT policy and in 2002, it also approved the Strategy for Innovation in Science and Technology. The government also approved an action plan in 2002 that had as its main objective to design and implement strategic ICT projects in all organizations and institutions. According to the Mozambique ICT policy (2000), higher education and research institutions must play a major role in seeking and implementing solutions and methodologies which will allow the expansion of the use of ICT for production processes, the provision of services, as well as the development of teaching and learning process in order to improve the living conditions of Mozambican citizens. The ICT policy contributed to other policies that have an impact on the development of the country in certain areas such as in 2002 “the Code of Fiscal Benefits first approved”, which facilitates the achievement and earnings of goods and equipment for ICT investment. Because of this law, institutions including education and research organizations can easily adopt ICT equipment to facilitate economic development. According to the questionnaire responses there is no legislation that specifies, it is mandatory to use ICT for teaching, learning and research in Mozambican higher education. However, from all responses, it showed the need of official documents such as strategic plans, institutional vision, and action plans for ICT within their institutions. ICT has been part of the referential framework of current government policies and this has influenced the referential frameworks of institutions of higher education. Unfortunately some of the institutions in Mozambique have very poor ICT infrastructure, and sometimes lack even a simple website for information. For effective implementation of ICT some institutions still need to design action plans that require the use of ICT as a key tool for teaching and learning. Though Mozambique is developing ICT access through education, but this country has also gender discrimination problem. Research shows women don’t have that much access of ICT, smart mobile, internet.

## **Gender issues in Mozambique**

Engendering ICT policy is an area of great importance, perhaps the most important in securing the benefits of the information age for girls and women. If gender issues are clearly explained in ICT policy, it is unlikely that girls and women will cut the benefits of the information age.

Research and several experiments have shown that gender issues are never considered to implement without any clear attention of gender in policy. There is no policy about gender equal or gender-neutral in ICT in Mozambique besides having some thoughts in government policy that benefits generally everyone (Marcelle, 2002). Governments also state that the fact of already have a gender equality policy eliminates the need to spell out gender issues in every sectorial policy. On the contrary, there are some evidences which show that “policy rights that made for technological fields often ignores the necessity, requirements, and acceptance of women to be in technical field unless gender analysis is included” (Marcelle, 2002).

There are two types of gender issues in ICT policy. First type of gender issues affect nearly all aspects of access, in the broad sense, and in the sense ICT use. Another type of gender issues are classically arose in ICT policy. The first category of gender issues that affect in access of different areas and impact of new technologies on men and women have been clarified in many places and with a lot of alternatives. In the strategies for developing communications, many options should be made which include location of facilities, cost and choice of technologies. All of these can provide access to the majority of women who live in rural areas of countries in Africa. If the facilities have been made according to urban area and costs are high then few women will get access to technology. The availability of internet connection is only found within capital and major secondary cities in many developing countries, while the huge amount of the population lives outside capitals. (Marcelle, 2002). For women’s secure lives having access to information communication and technology is an essential concern. The structural image of rural areas with gender demographics prove that more women live in rural areas than men. And because of being majority in population women have smaller chance than men to get access to technologies. As UNIFEM and the UNU/TECH noted:

“Women, with their special responsibilities for children and the elderly, find it less easy than men to migrate to towns and cities. The urban bias in

connectivity thus deprives women, more than men, of the universal right to communicate (Olatokun, 2017).”

### **Social and cultural issues**

According to the culture and society so-called system women always get less access than men to all technological facilities that exist in developing countries. Generally information booths, any training centers or cybercafés are located in those places where women may not find comfortable going for technology (Marcelle, 2002). Women also find problem to get access of any technical communication facilities in rural areas because of shortage of time, as those are shared with public access and have limited time to be open. Women have given multiple roles and heavy domestic responsibilities, from so-called society and culture, women become busy to do all household works which affect their leisure time to visit any cyber-cafe or technical institution to get access for using or learning technologies. There also some center or institution has open evenings, when it is difficult for women to visit them and return safely to their homes in the dark. Their flexibility to have both access in transports and being able to return home safely are also more limited than men. All accommodations, institutions, cyber cafes must ensure that they have equal access to use ICTs for both men and women and have proper schedule of timetable for women, when they can get the access to use ICT, also some staff, trainers to provide women good service who are using for the first time. Besides that there is also a cultural aspect of gender and ICTs, that is gender discrimination towards women studying or using information technology (Marcelle, 2002). Though, nowadays women are heading to technology world, there are still problems in attracting young women to science and technology studies. Especially, in Africa the problem has proven to reach at worse level comparison to other regions. Most of the math and science teachers in countries of Africa have a auto ready thought that girls can't think or work scientifically and that science is too mechanical and technical for girls and women, which leads to discourage girls and women to study. In every case, women in developing countries have always given less importance than men while thinking about getting proper education and knowledge. Two-thirds of the world's 876 million illiterates are women, and there is least expectations to decrease the number of illiterates significantly in the next twenty years. This generally results because of limited exposure of women and always been isolated from the society in developing countries,

particularly those who was raised to just take care of home and women who live in rural areas.

### **Financial resources**

No communication system is free, almost every way of communications require money. For example: if someone wants to talk over the phone, the person needs to pay mobile bills, even if communication in social media is free but you have to pay the internet bills or pay charges to go in cyber cafes, even to watch television or listen to the radio you have to pay. And, women in developing countries like Africa have less access, capability to own radios and televisions than men, or to access them when they want to, in the case of household possession of the technology (Marcelle, 2002). When it includes paying for information access, such as at a rural information center or a cyber cafe, women don't have the earnings to pay those, even if they have they think twice about food for family, education for children, clothing resources than paying bills for information access.

In 2000, Gillian Marcelle (Marcelle, 2002) looked through the ICT policies that evolved in four countries: Mozambique, South Africa, Uganda and Senegal were made by leaders for national policy in different areas known to be advanced in gender equality. But, in Mozambique existing policies do not include any treatment of social issues, including gender gap.

### **Innovation and ICT**

The concept of innovation is originated from Greek word (καινοτομία; kainotomia), in the fifth century BC. The word is derived from καινός (kainos; new), but in current scenario there is no need to do anything with “καινοτομία” word as basic meaning of innovation has commercialized as “technical invention”. Innovation meant “cutting fresh into”, it was used in the context of making something new with unique idea that can make an impact in the real world and can solve any real life issues. Innovation comes from the imagination of something new development. According to research of ancient philosophers and writers on political constitutions, innovation is “introducing change to the established order”. Research shows that, at present scenario “Innovation” is playing an important and main role in the economic growth in all the industries and particularly in Information Technology (Godin, Lucier, & sur la Culture, 2012). Innovation is “complex, nonlinear, multidimensional, and unpredictable”. It cannot be categorized with any single measure to define innovation

properly. To integrate the knowledge into an innovative project, service or process, having illusionary assets fulfill the knowledge and skill of any organization which plays as vehicle. Organization or company or any institution is very important medium towards working innovative projects. The outcome of the work with unique idea always needs to be successful. The efforts and investments made for the innovative work get loss when the idea doesn't become successful, but having organization can absorb the lost investment and encourage continuing further.

Besides that the size of the organization, the amount of team members play an important role while working in innovative ideas. Even for the development of an organization, having the mindset of the top management and the policies towards innovation are also very important, because this helps to sustain and support innovation. Innovative idea must be very effective for the growth of the organization which will make it to stay longer in the competition of innovation; otherwise organization may leave if it doesn't see the outcome of its growth.

To come out from the pillar, some organization needs to innovate. To have always profit for the organization also makes them to be more active in innovative world. That's why every company has different reasons to be innovative and has people who work on innovative projects. The Information technology sector is always highly considered to be intensive and seek for innovative works always (Chatzoglou & Chatzoudes, 2018). Now days, students becoming more interest on innovation and entrepreneurship, that's why college offer entrepreneurship courses and activities where students can join and come up with fresh and innovative ideas. Almost all universities offer entrepreneurship programs and activities including workshops, boot camps, internships, pitch events, competitions, and startups. This research also concerns using Innovation Science to better understand the risks associated with entrepreneurship for the proposed system to reduce sexual violence and to be aware of how to reduce those risks. Several senior editors did some survey and informal study during summer 2012 over 300 institutions to determine how many of them offered courses in innovation. The overwhelming majority of them did not offer any courses in innovation but they offered entrepreneurship for students to try innovative experiments.

Developing a smart technology to reduce women sexual violence, also targets to be innovative as the purpose is creating a system that will not only solve problems of sexual

violence but also secures safety of a person and encourage to decrease the gender discrimination, increase access to technology in developing countries.

## Methodology

The proposed method to reduce the sexual violence against women is to develop a mobile application and a smart wristband, which will be connected to mobile application via Bluetooth and will be activated through sensors (Helen et al., 2017). This system will help women to save themselves from any kind of harassment, sexual violence or panic attack or any dangerous situation instantly. This paper discusses the development of a prototype of the proposed system and some research work based on this issue. The development of the prototype was in process and the idea was to experiment this prototype in real life with some women with disabilities in Mozambique and for the research, qualitative research method would be used. So that, after experiment and interviewed participants, some data could be collected and used for further development of the system. Due to lack of technology accessibility in Mozambique only interview have been performed and persona have been created to analyze user experience while using the system. Figure 1 shows the architecture of the system and following more details will be discussed about the work of prototype and how data has been collected and reached into systematic result:

## System Architecture

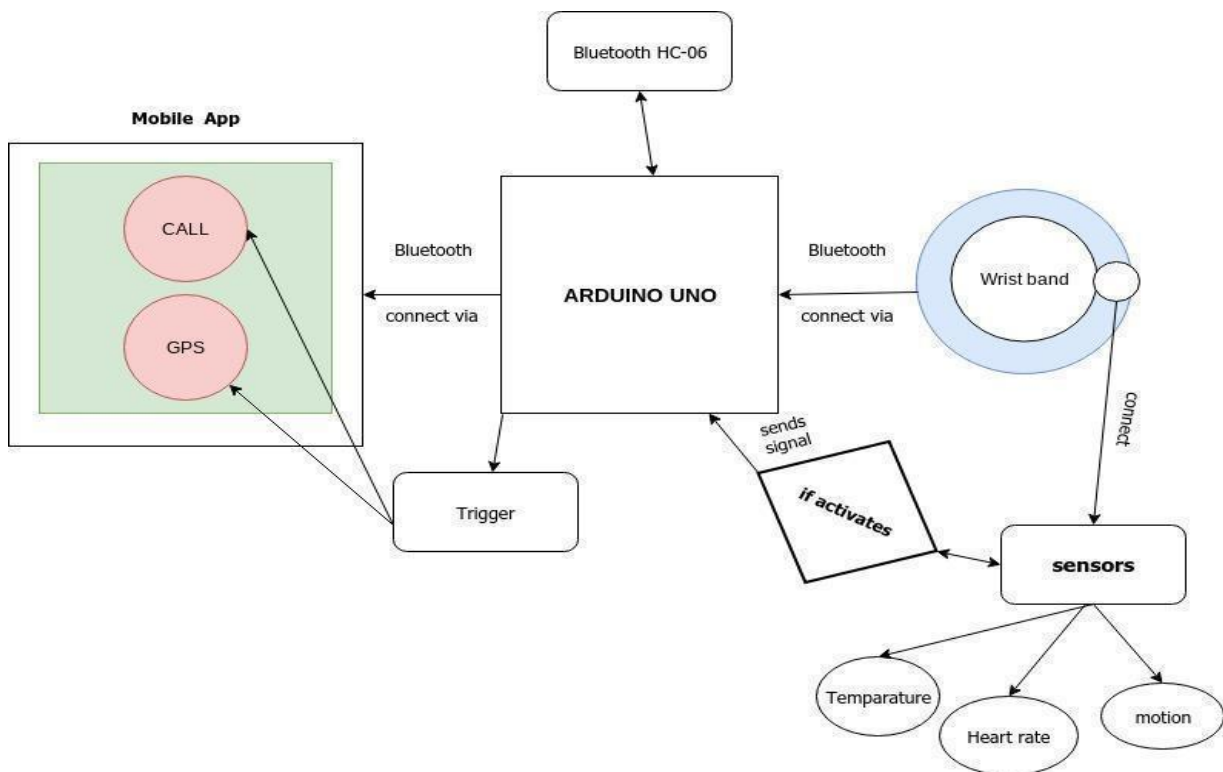


Figure 1: System Architecture



The figure 1 describes the system, how it will be functioned. Once the sensors of wrist band will be activated, it will send signals to Arduino via Bluetooth, after getting signal Arduino will send signal to the mobile app, and the button to call the numbers that registered in emergency contact will be triggered, so that it can call people and send location to the people via a message saying that “the person is in danger and needs help”. It will also ring a siren, to help user instantly until someone comes to rescue her.

For implementation, at first the mobile application has been developed; according to existing work there are several applications have been developed for women safety and security (Chand et al., 2015). In this work, a simple and easy access application has been developed. This application has one button to send current location and a message mentioning that the user is in danger, she needs help. It also has feature to save emergency contact numbers, which is really effective and helpful for women who will be in danger (Akash et al., 2016). When the user will be in danger, the sensors of the device will be activated and triggered the button of the mobile application. The idea here for sensor is to use multiple sensors to avoid unnecessary activation in normal situation. The sensors can be used are: temperature sensor, heartbeat sensor and motion sensor. Heart rate sensor detection is used in this appliance to activate the sensor when the targeted heart rate is achieved and to provide security to the user via smart watches integrated with the sensor, the heart rate differs for each and every feeling (Helen et al., 2017). Temperature sensor plays a vital role in human health condition which will digitally displays the body temperature of the user. Motion sensor is used to detect the type of motion the user is victimized when the targeted heart beat is reached. The main concept of the whole process is to trigger the heartbeat sensor when it attains the targeted heart beat rate and time period (Helen et al., 2017). When the threshold of sensors will cross, it will trigger the app and it will call all the contacts which will be registered on emergency section of the app (Helen et al., 2017). This emergency feature will instantly call friends or family, also nearby police stations, so that they know the user is in danger (Yarrabothu & Thota, 2015). To track location of the user, each android system provides developers with a basic Application Programming Interface (API), for example: GPS tracker (Luchetti, Servi, Frontoni, Mancini, & Zingaretti, 2013). Android notifies periodically, generally once in a second when GPS satellites signal changes. GPS helps to track location, so it will be very

beneficial when any woman needs help. That's why in this system besides emergency contact there can also be GPS tracking option (Hariprasath, 2013). After developing the mobile application, the device will be implemented with the application.

This paper focuses to develop a prototype with one sensor as implementing all sensors in device is time consuming. To develop the prototype: temperature sensor, Arduino UNO, Bluetooth have been using. When the temperature sensor will cross the limit of it, the prototype will send signal to the application via Bluetooth to activate the application. After activation, the app will send a message and give a call to emergency contacts by triggering the button of the mobile application. The message also contains the current location of the user via Google maps. Also a GPS tracker can be implemented, to track the place of the victim if the place keeps changing.

### Implementation of Prototype

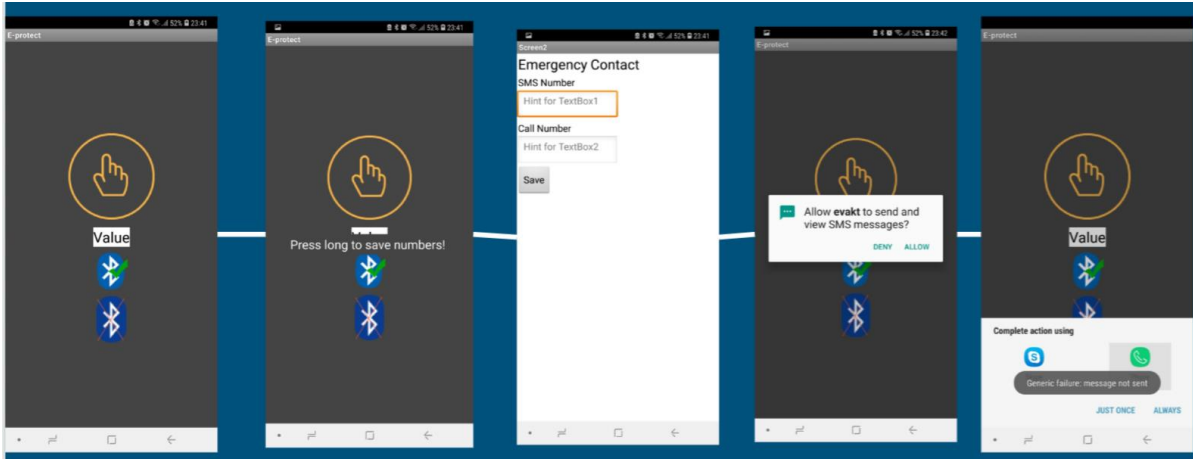


Figure 2: Mobile Application screenshots.

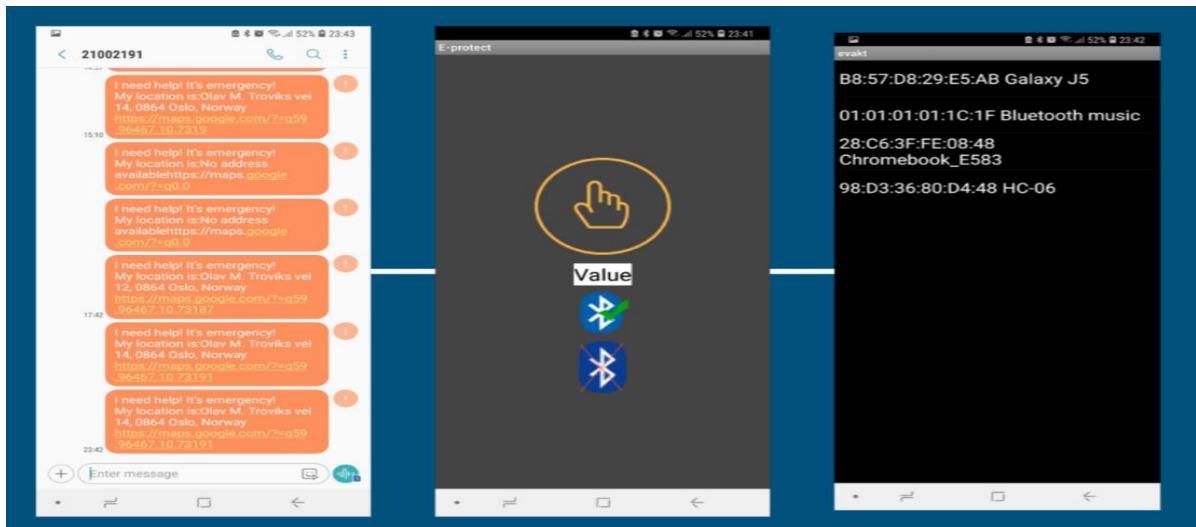


Figure 3: Screenshot of Mobile Application with Bluetooth screen and message screen.

A mobile application has been developed; the application is supportive for android mobile. There is one button, it has sign of hand to express that user needs to press the button, this button will work to call emergency contact people, also will send a message "Emergency! I need help". While user using the mobile application for first time, user needs to save numbers in the application as emergency contact, so user needs to press the button a little bit longer time, so that it goes to the second screen of the application where user can save numbers for emergency contact as shown in the figure above. There is also a Bluetooth button has been kept with the icon of Bluetooth, it is needed to connect the application with the hardware which is built using Arduino UNO. Arduino has been used for controlling the sensors.

## Hardware Development



Figure 4: Image of Arduino connected with Bluetooth

For the hardware development, Arduino UNO, temperature sensor, Bluetooth have been selected to use. It's still in development process, it will be programmed so that it can send signal to the mobile app via Bluetooth and triggered the buttons, to help the victim. To make it compatible with the mobile application there will be also changed in backend work of mobile application.

The purpose of implementing the prototype was to test it with some users practically while taking interviews to check the initial stage of the whole system, whether the temperature sensor works according to the body temperature, how high the threshold should be, is it easy or difficult to use Google assistant for the application when the user needed, how difficult or easy for a user to use the prototype, because that will help to develop the system further in a better way. But due to lack of enough time, prototype was not completed properly and due to lack of access to technology in Mozambique and lack of knowledge for women to use technology there, the plan to complete the development and test it practically was not continued further.

The proposed system can be really effective for women to reduce sexual harassment in Mozambique. This device will be so light to wear and also in reasonable price so that

anyone can afford. Also, as this device will be activated through sensor, people with disabilities can also use this. The purpose of this system to make it as much universally accessible as possible, but in this initial stage it is following some universal design principles. Universal design principles have been developed to build flexibility of use into both the user interface design and operating systems of a system (Elias, 2011). The mobile application has been designed considering one of the universal design principles "Simple and intuitive to use". It has simple interface and also can work offline. This principle is really important while developing any mobile application, because simple user interface makes easier for anyone to use the application, even if the person doesn't know how to use mobile application or illiterate. In figure 2 it shows how the screen has been designed, so that anyone can easily understand. Universal Design was defined by Mace in 1988 as "design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Mace, 1988). The value of universal design is to make products easier to use by reducing the complexity and minimizing individual's reliance on their physical and cognitive capabilities in interacting with them (Imrie, 2012). Universal design principles are used to create products and interfaces in a way that any person, especially people with disabilities can use and access. Designing usable mobile applications for people with disabilities applying universal design principles enhances the usability for all other user groups and for this research, making a mobile application that following universal design principles is one of the most important work during developing the prototype (Chisnell & Redish, 2005). Another principle this system is following is low physical effort. The physical effort related to inputting text into devices is therefore a primary concern (Elias, 2011). As indicated in relation to SMS usage, the difficulties associated with inputting text data into mobile devices poses the challenge of developing new, authentic, and inclusive forms of assessment. For this research the challenge would be saving emergency numbers but it has been designed simply and connected with mobile, so the user just need to save the number from mobile and for people with disabilities for example: vision impairment, physical impairment they can use Google assistant to save the numbers. Besides that when a user will use it, it will auto work through sensor, so no one needs to take out mobile and click button to send message and call. It is also focusing and ensuring to provide some solutions that woman in rural areas,

illiterate women and who doesn't have access with technology, get access and can use it in their daily life.

### **Interview Method**

Qualitative research method has been used for this research. An Interview is a conversation between interviewer and interviewee whereas interviewer asks questions on specific topic and interviewee responds accordingly. It is a two-way communication between these two parties. Interviews usually require a transfer of information from interviewee to interviewer, which is normally the primary purpose of the interview. However, information transfer can happen in both directions simultaneously. Face-to-face interviews have long been the dominant interview technique in the field of qualitative research (Opdenakker, 2006).

In this report a description about qualitative (Antonius, 2003) semi structure pattern of interview is to know how users want to see next generation by collecting information of user experience and functional features.

### **Face to face interview**

For data collection 5 users for face to face interview have been selected in Mozambique. The users were women with different disabilities, psychologist and some general feedbacks have been taken about the proposed idea from women involved in organization who are encouraging women to learn about ICT. The information has been gathered in a confidential way from all participants, as we respect their personal care and their privacy.

The interview was face to face interview, before taking interview the idea of this research had been described, how the system will work, what is the main focus topic behind the idea, why the topic harassment has been chosen, everything has been described before taking interviews. After that, they have been provided the consent letter, where it was described that they were okay with the interview, the interview would be recorded and during interview if they felt not to answer any questions, they could easily skip that. They signed on the letter and then the interview had been placed. The interview was taken individually, each person at one time. When one person was given interview, others were not in the same room, so that the data were clear from each person's perspective. No one could listen to others and manipulated their own answers. Also according to ethics, the

answers should not be shared with others, that is why individual interview was taken with each participant. There was also one person always responsible from Mozambique to help for translation while taking interviews, who knows about the culture and aware what to follow while translating everything in interview for both interviewer and interviewee as the participants only speak and understand Portuguese. Also before starting the interview, the person was given instructions about not sharing data with others and other privacy concerns which have been discussed more in ethics of this paper. Each interview took maximum 40-45 minutes. Interview was so intense as the topic is so sensitive. While asking about harassment, violence in Mozambique, it was really overwhelming because it showed in their face that how pathetic it is to talk about this issue and no one was taking responsibility to solve these issues. Even while talking about technology, it seemed Mozambique doesn't have that much access to technology, specifically not all women don't get the opportunity to use smart phones.

Following are the interview questions that have used for interview:

1. Interview with people generally to get feedback in context Mozambique:-
2. What is the current situation in Mozambique regarding women harassment? Is it a case that almost happening every day or sometimes? Also in context of women with disabilities?
3. What kind of harassment happens most in Mozambique you think? Is it street, office or in family etc?
4. What should be the best approach in your opinion to solve this issue?
5. What kind of awareness they should take so that they can save themselves in these situations?
6. What do you think about the majority of women use smartphones in Mozambique? In context of women with disabilities?
7. Do you have any idea, thoughts about any organization in Mozambique who are working for women with disabilities?
8. What kind of technology you think, they are using for assisting women with disabilities? If any
9. What kind of barriers you think women with disabilities will face during using this system in Mozambique?

The interview questions were prepared to gather information generally about their opinions regarding sexual violence, if they have idea about current state in Mozambique regarding violence and access of ICT. The reason behind creating interview guide in general

way was the lack of enough access of technology, which was barrier to test and interview participants about the prototype.

### **Feedbacks from UNFPA and other technical students**

Besides taking interviews, to get more insights about this research feedbacks also have been taken from women who are working with UN, in Mozambique they call it UNICEF and other organization who work to teach women about technologies and make them more comfortable to come in tech field. While taking feedbacks, it showed that they are working on to make technology more accessible for women but it would take some years to reach there. They are working on some projects to solve these types of social issues for example: education about sexual violence, awareness about harassment and some projects about accessibility of technology, smartphones in rural area. So, after listening about the research, they got interest in it and talked more about it, but the main issue they raised again about education of technology and accessibility of it.

Also some students from the university have given some feedbacks and challenges user can face while using the system.

After collecting all data from interview and feedbacks, transcripts have been made and analyzed the interviews frequently to get contents and analyze them. Also the texts have been analyzed to understand more about their own experience during interviews and talking about it. Then from interviews the common issues have been detected and narrowed down as theme which helped to get more clear results and solution of these issues.

### **User Testing**

As mentioned earlier, idea was after developing the prototype, practically the prototype would be experimented with some participants, to understand how they can handle the system during dangerous situations, to observe are they comfortable to have the prototype, to observe how fast the prototype responses in the situation. Does the prototype response according to the measurement that will be put for temperature sensor or not. But, due to lack of accessibility of internet and technology in Mozambique only interviews has been conducted and persona has been created to know about usability of the prototype.



## **Persona**

Here 4 types of persona have been used to analyze the proposed system, how this can be useful in dangerous situations, what can be consequences and what should be improved to make the system more users friendly.

### **Vision Impairment**

**Name:** Cerci

**Age:** 20 years old

**Status:** She is a student and goes to college.

**Challenges:** Vision impairment

### **Background**

Cerci is a college going 20 years old girl, she has vision impairment, but she can use all smart technologies with Google assistant. She is an independent girl and she doesn't like people helping her because of her vision impairment, so she does everything by her own. She everyday takes the bus from the bus station near her home till her college and before taking bus she needs to walk almost 15-20 min till the bus station from home. The road of her home for bus station passes through a park, which is generally a quiet place, few people like family with children go there during weekends only, otherwise in weekdays hardly people goes to park. So, Cerci always get scared while passing through that road towards bus station, especially in the evening when sometimes her classes continues late and there's not that much people coming on that road. She hates the walk from her home till bus station because, on that road there are some people who sometimes try to tease her and few weeks earlier one incident happened where a married woman got raped in evening by 2 men. Ever since Cerci started her college, she gets scared so much while passing that road, sometimes she becomes so nervous and gets sick. She feels like someone is always following her and trying to attack her. So, one day she actually fainted because of her nervousness and being scared while passing the road. Some people took her home and then her mother realizes, Cerci needs a support, which can let her feel safe and she can use even if she is in actual dangerous situation. So her mother brought her "E-sikrere", and registered her number on the application, so that when she needs it can auto call her, also as it's a light-weighted and multiple sensor based wristband and Cerci has mobile always with her, so it's easier for her to use "E-sikrere". So, from next day she has been wearing "E-sikrere" and going to college.

### **Scenario**

After one week, while she was coming home in the evening after her college finishes, she was feeling some men were following her towards the road, she could hear some voices coming towards her and it was almost getting night, no one else was around. She suddenly got scared and panicking and temperature of her body got increased, because of that her

wrist-band got activated and sent a message and a call to her mother, then her mother realized Cerci needs help, she came out of home and noticed Cerci is in the middle of the road and those men were still there. But after seeing her mother Cerci got relieved and safely reached home. Now she is confident about “E-sikrere” and wears everyday.

#### **User Journey**

**Step 1:** Install the mobile application of “E-sikrere”

**Step 2:** Check Google assistant if it’s working properly for the application.

**Step 3:** Register emergency numbers in contact list of the application

**Step 4:** Wear the wristband

**Step 5:** While getting attack or getting scared, temperature of body get increased and it activates the sensor.

**Step 6:** The sensor give signal to mobile application and trigger the button.

**Step 7:** It sends message and call the number of her mother.

**Step 8:** Her mother saw the message with Cerci’s current location and came to help her.

#### **Physical impairment (upper limb)**

**Name:** Saista

**Age:** 30 years old

**Status:** Works in a multinational company

**Challenges:** Physical impairment (upper limb)

#### **Background**

Saista is 30 years old a married woman, who works in a multinational company, her upper limb of the body is impaired, but that didn’t let her stop working outside and managing her family at the same time. As her company is a multinational company, people from different countries work there together. Fortunately, her working environment is good, all her colleagues support her and respect her. So, everything was going well and as usual at her workplace until a new Managing Director appointed for the company. After the MD got appointed, he was so friendly and nice to everyone and always showed special care for Saista as her performance towards work was always been impressive. But day by day, the MD is trying to get her closer because his intention was not right and somehow Saista could guess little bit. But she couldn’t do anything until she gets a strong proof, as he is MD of the company. Sometimes MD called her in his cabin through excuse of work and teased her,

because of that Saista didn't feel secure any more to go to office and work. She used to cry at home after coming from work and she was scared one day something big would happen with her and no one could save her. So, she told her husband about the issue and her husband brought "E-sikrere" for her and he saved his number on the mobile application for her. So from next day she used to wear the wristband for her office.

### **Scenario**

Suddenly one day after office her MD offered her to stay at the office, little late on the excuse of some deadlines. Somehow she realized MD's intention so she was prepared, she was clever enough, she thought to register police number as well in mobile application, but for her the challenge was to save number as she is impaired by upper limb, but fortunately Google assistant helped her and she saved number of police as well. So at night while working, MD tried to come closer to her and abuse her, that time her heart-rate went faster and it activated the wristband and trigger button of mobile application, so her husband and police got a message, got to know she needs help urgently. Police didn't know the place so he followed the location that sent with message over phone. So, they came and rescued her. After that Saista got scared but she felt secured and got confident that "E-sikrere" is there for her safety.

### **User Journey**

**Step 1:** Install the mobile application of "E-sikrere" by help of Saista's husband

**Step 2:** Check Google assistant if it's working properly for the application, in case Saista needed it.

**Step 3:** Register emergency number in contact list of the application.

**Step 4:** Wear the wristband.

**Step 5:** Saista realized, she needs help from police., She registered number of police through the help of voice over.

**Step 6:** While MD coming close, her heart rate started increasing.

**Step 7:** After some seconds the sensor gets activated and triggers button of mobile application.

**Step 7:** It sends message and call her husband and police at the same time.

**Step 8:** Police saw the message and detects Saista's current location and rescued her.

## **Illiterate**

**Name:** Alicia

**Age:** 25 years old

**Status:** Homemaker and caterer

**Challenges:** She is illiterate, can't read and write.

### **Background**

Alicia is a 25 years old married woman, after class 4, because of financial status, she couldn't continue her education. Now she is a housewife and she also runs catering business as she knows cooking very well. She cooks from home and then delivers different places. for example: lunch for companies, food for school canteen and also in some houses etc. Her husband was an alcoholic and aggressive, he sometimes used to bit her at home while arguing in some issue. Day by day it's getting worse, but she couldn't ask for any help while her husband bits her. So, the places she used to deliver food, one of the employees from one workplace, asked her the issue and suggested her to use "E-sikrere", and gifted a smart phone so that next time when her husband tries to do domestic violence she can take help from police. She showed her how to use the system, helped her to register number of police and explained what the benefit of using it is. So, she started using the wristband.

### **Scenario**

So, one day her husband came home at night, he was so drunk and he became so violent at her wife, because of that Alicia, her wife got scared and her temperature rate of the body started going up, because of that the wristband got activated and triggered button on mobile application, which sent a message and call the police. It took a little while for police to come, that time siren helped her, her husband got scared after listing siren and then police came and rescued her from her husband. After that Alicia experienced the benefit of using the system, so used to use the system in daily life so that it can also help her from any kind of other dangerous situations.

### **User Journey**

**Step 1:** Buy a smartphone and the wristband.

**Step 1:** Install the mobile application of "E-sikrere"

**Step 2:** Check instructions and get familiar with how to use it.

**Step 3:** Register police's number in contact list of the application.

**Step 4:** Wear the wristband.

**Step 5:** While getting attack from her husband, temperature of body get increased and it activates the sensor.

**Step 6:** The sensor give signal to mobile application and trigger the button.

**Step 7:** It sends message and call the number of police..

**Step 8:** It took time for police to come but the siren made her husband scared.

**Step 9:** Then police came and rescued her.

## **Women without access to technology**

**Name:** Tina

**Age:** 32 years old

**Status:** Educated homemaker

**Challenges:** She has studied up to school and she never gets a chance to use any technology.

### **Background**

Tina is 32 years old girl, she is educated, she studied until 2 years of university, after that she got married and didn't continue education, she focused on family. So, her life gets limited only going shops for buying household staffs and cooking food at home, helping her children for education. In this journey she never felt to have any smartphone, she has normal mobile phone just to contact someone in an emergency. So, she doesn't know about any smart technology, how to use it and any other digital services. Tina's husband is business man and has one personal secretary, he helps him for accounting and other small works needed for business. As he was personal assistant, he sometimes comes at home for work. Day by day, the relation was getting closer with Tina's family with his husband's secretary. He became as a family member, Tina's children like him and enjoys playing with him. And Tina considers him as younger brother. But his intention was not good, the excuse of his coming home was increasing and especially the time when Tina's husband, children not at home. So, Tina started realizing that her husband's assistant is not a good person. And Tina told her husband about the fact but his husband ignores because according to him he is a good person. Then she shared this with her close friend and her friend helped her to use "E-sikrere". She showed her how to use the system, helped her to register number of police and her husband, and explained what the benefit of using it is. So, she started using the wristband.

## Scenario

Suddenly one day his husband's assistant came home to take a file, but Tina got alerted that he didn't come just to take file, his intention was something else. So, after entering home, his assistant asked for a cup of tea. Tina went to the kitchen to prepare tea, that time the guy entered kitchen and attacked her from backside. Tina got so scared, she started screaming and moving body so speedily to save herself. That time the sensors got activated and sent messages to police and her husband. Her husband was surprised and scared, he quickly came to home as his workplace was nearby, also police came and arrested the guy. After that Tina felt secured and got confident that "E-sikrere" is there for her safety.

## User Journey

**Step 1:** Buy a smartphone and the wristband with the help of Tina's friend

**Step 1:** Install the mobile application of "E-sikrere"

**Step 2:** Check instructions and get familiar with how to use it.

**Step 3:** Register police's number and husband's number in contact list of the application.

**Step 4:** Wear the wristband.

**Step 5:** While getting attack from his husband's assistant, Tina got really scared and started screaming.

**Step 6:** The sensor got activated.

**Step 6:** The sensor gave signal to mobile application and trigger the button.

**Step 7:** It sends message and call the police and her husband.

**Step 8:** It took time for police and husband to come but the siren made the attacker scared.

**Step 9:** Then they came and rescued her.

## RESULTS

After analyzing the collected data from interviews and persona analysis, it shows that the idea of this research is in an advanced level according to current conditions in Mozambique. To make this system workable in developing countries like Mozambique, first some general steps need to be taken to solve the social issues. In the following sections, the issues have been categorized in certain topic to highlight them and also have been described possible solutions to solve these.

### **Gender Gap**

Mozambique has gender gap issues, there most of the men work outside and women stay at home. The culture somehow grew as women are born to handle family and men are born to earn for family. Even the harassment also happens because of this gender discrimination. The society thinks women are weak; they can't raise voice and take action. And even women also accepting it and that's why harassment is hidden fact in Mozambique.

There is a need to encourage changes in cultural attitudes. The gender gap in education is often due to domestic responsibilities, and traditions that downplay the importance of girls' education. Above described all these problems have been talked during the interview and it proved that first these issues need to be solved and once these issues are solved then the proposed system to reduce women harassment can be implemented in Mozambique.

### **Education and awareness about harassment**

While talking about harassment during interview, it showed that how hard and hurting it was for them to express about how harassment happens with women in Mozambique, especially women with disabilities. They face 3 times more harassment issues than women without disabilities. And this happens almost in every environment workplaces, schools, organizations and even in own family. And after someone faces harassment, no one goes to police station or to anyone to talk or report about it. Because, they also don't take these issues seriously.

### **Lack of help from government**

Even they are not getting any help from government, which was shocking and really painful fact. Government doesn't take these issues carefully.

### **Lack of proper education**

One of the biggest reason behind it, is people are not getting proper education about what is wrong and right, also girls, women are not getting proper guidance, awareness regarding harassment which needs to be done as soon as possible. Somehow they were told from

childhood, this is common, this happens generally, so if they face it they just ignore it and accept the fact that no one will support or help them though it's not right.

But these can be solved, just they need to get education about it from schools, even in family parents or whoever responsible to raise, need to teach their children about harassment.

### **Campaigns**

There should be campaigns in different organizations, on tv channels. Also girls need to be encouraged to talk about it, so that if they face it they can complain to someone or in police station. If people starts giving education, awareness about harassment, sexual violence in schools, at home, in organizations then girls, women will get the confident that there are someone to support them, thus these issue can be solved.

### **Access to ICT**

Mozambique is not that much accessible in technology area comparison to other developing countries, only people in urban area uses smartphones. And statistics showed that most of the people are men, who using smartphones, internet; few women in city area uses smartphones but also they are not that comfortable with technologies. The reason behind it:- most of the women never got the courage to use technologies. They just stay at home to handle their family and do household works, no one was there to encourage them to use technology, that's why they don't feel confident to use it.

But this can be solved through some simple steps:

### **ICT in education**

Providing ICT education in schools and letting girls and women to take that education is the first step that need to be taken. The government should also integrate ICT skills training into the curriculum early on, to equip girls with the tools they need to enter the information economy.

### **Regular campaigns and awareness**

Having regular campaigns and encouraging girls and women to choose ICT as education and profession is also important. Campaigns regarding how women can also enter ICT world, it's not only men thing and giving them the confidence.

### **Low cost mobile service:**

Another issue have been raised during the interview is about economic status of the country. Everyone can't afford smartphones, can't pay bills for mobile services, internet. Because of this issue, even if there is any technology to help women from harassment, they won't be able to use the system.



To solve the issue Mozambique could consider introducing a subsidized or free Internet access scheme, providing more women with the opportunity to use the devices they already have to get online. If mobile operator can provide free message service for women who can't afford to use it, this can also encourage them to use it more often.

## **Findings from Persona**

### **Vision Impairment**

From the persona of Cerci and according to the incident she faced, first the challenge has been detected is she has vision impairment, and because of that her most challenging task for this system is to install the application in mobile and then register the numbers. But fortunately her mother helped her and also this system can support voice over, so she can easily use it to install the mobile application and register number.

Another challenge for her could be, what if her mother didn't notice the message or busy in work or Cerci was in a place which is far away from home for her mother to come, in that case if a siren can be implemented then that will help her in dangerous situations, also having more than one number registered in the application, can help her to be rescued from these situations.

### **Physical impairment (upper limb)**

From the persona of Saista and according to the incident she faced, first the challenge has been detected is she has upper limb impairment, because of that her most challenging task for this system is to install the application in mobile and then register the numbers. But fortunately she can use Google assistant and her husband was there also to help her while using it for the first time, so she can easily use it to install the mobile application and register number. Another advantage as this system is sensor based, she doesn't need to use her hand to take out mobile and trigger the button.

Another challenge for her could be, what if her husband didn't notice the message or busy in work, also police took time to find the place or Saista was in a place which is far away from the places they need to come, in that case the siren can be effective and will help her in dangerous situations, can help her to be rescued from these situations.

### **Illiterate**

From the persona of Alicia, the first challenge she will definitely face is she doesn't know how to read and write, so it's difficult for her to use smartphone and the system, besides that her financial status is also not stable that she can even afford a smartphone. But the possible solution for her could be, if there are cheap smartphone have been provided, mobile operator makes the charges free for women like Alicia. Also the incident she faced, it's almost a common issue in most houses of developing countries. Domestic violence happens mostly in Asians and African countries, because of gender issues as mentioned

earlier in the interview findings. So, if there is awareness, campaigns happen for these issues, the problem will be solved half already. Basic education is prime right for every woman in this digital era, though she is a homemaker. Another challenge for her could be, what if police took time to find the place and come late where Alicia was living from the place they need to come, in that case the siren can be effective and will help her in dangerous situations, can make her husband conscious and help her to be saved from her husband.

But the advantage of this system is, it has been implemented with simple UI, so even for illiterate women, it won't be that difficult to use if other social issues have been solved.

### **Women without access to technology**

From the persona of Tina, the first challenge she will definitely face is she doesn't know how to use any technology though she is educated, so it's difficult for her to use smartphone and the system, so she needs someone at the first time while using the system. But the possible solution for her could be, if technology is accessible for women as well. Because of gender issues as women have been considering only staying at home and taking care of family, while if they would have been given a chance, they will be so ahead then men. So, if there is awareness, campaigns happen for these issues and women have given equal rights and education the problem will be solved half already. Basic technical education and encouraging women to be in technical world is important for every woman in this digital era, though she is a homemaker. Another challenge for her could be, what if police took time to find the place and come late where Tina was living from the place they need to come, in that case the siren can be effective and will help her in dangerous situations, can make her husband conscious and help her to be saved from her husband's assistant.

## ETHICS

To do the interviews and to collect data for this research, a notification form has been submitted to the Norwegian Center for Research Data (NSD) as some private information can be gathered from the participants. The purpose of this form is to get approval from the Norwegian Center for Research Data, so that researchers get the permission to collect and analyze the data from the interview without any legal, economical obstacles.

Before conducting the interview, all the participants have been provided a paper stating that they agree with interview and the data could be collected to use it for the research. The paper also has some information regarding privacy and policies.

Privacy protection is really important for any researcher. Everyone is concerned about their personal information and don't want to share usually without any purpose to any stranger. And this research is focusing about sexual violence, so the data are more protective and there is concern about sharing it (UCI ). So, the identity was anonymous, no name, address, phone number or email id had been asked but they have signed the consent letter which could be counted.

The interviews were recorded and they have also been asked before recording the interview as their consent is also important to know if they are okay to record their provided information and this has been mentioned in consent letter as well. They have been given a surety that these recordings will not be shared with anyone not even the supervisor of this project. And after using data from recordings for research work, those will be destroyed. And in consideration of not sharing data with anyone, interview was conducted individually with all participants, one translator needed to be there as participants could only speak their own language.

Translators play an important role while conducting interviews and they need to be also careful about ethical issues of translating participant's answer. They have to keep in mind that they translate the answer accurately, they need to be careful about the cultural

understanding and also they need to be professional as the collected data are going to be used for research (Ulatas, December, 2016).

So, for this research the translator was also given instructions to be professional, confidential about the information and be accurate while translating.

To show respect to the participants during interview it was also important to make sure that they have been provided the right to choose whether they were okay to answer all interview questions or not, were they comfortable to use their data to publish the paper and for future development.

No false information has been provided during interviews and the communication was in their local language which was easy for them to have a conversation on this sensitive topic. And after conducting the interview, they have been appreciated for their collaboration.

## Discussion

The aim of this research is to give an effective solution of the issue that women are facing nowadays in their everyday life. Harassment, sexual violence or abuses are major concerns for women; either they go outside for work or stay at home (Schneider et al., 2010). The proposed solution for this issue is to have a sensor based smart wristband which will be connected with mobile application so that when someone in danger situation, the wristband can trigger the application to give a call, send messages and also give the current location of the person who is in danger. To develop the proposed system, this paper focused to do some initial development of the proposed system, which will be continued in future research work. The purpose was to develop an effective and usable prototype which would be used during taking interviews and also would be tested with the participants to capture better data for further development. But as mentioned in results that due to lack of access to technology in Mozambique, it turned out to first focus on the issues that Mozambique facing to have better access to technology for the country.

While developing the prototype of this research, it was planned that the prototype would be used in the field work in Mozambique and more technical data could be gathered for further development of the proposed system. The prototype would be used to test how fast it responded according to the situation and how participants feel comfortable to use it in their everyday life. But it turned out the given time was not enough to even develop prototype properly and expectations was the rest could be done in the beginning weeks of field work and that would make easier for development process as it would be done in the field work place. But, unexpected challenges occur while doing field work in Mozambique.

Mozambique is one of the developing countries, where technology is taking place in education and in other developments for the country but the process for having it usable everywhere is not working effectively (Muianga et al., 2013). After entering Mozambique, first challenge was the language barrier, people don't speak English and understand English, it was so difficult even going grocery shops to buy things. This was the biggest barrier for interviewing people, but fortunately one translator was arranged by the university. The next challenge was lack of access of technology, the internet and expensive mobile operator service. As the main purpose of this thesis was to provide a smart

technical solution for women's safety, so to make progress of the development, internet was needed badly but internet access was so poor and using mobile internet is expensive to use for development. And for these issues, development wasn't done anymore and focusing on taking interview turned out as better solution.

For interview, it was difficult to find people because sexual violence is a topic that is hidden in Mozambique, some women don't even know this term though it's happening in Mozambique from years to years. The reason was lack of knowledge about sexual violence, lack of policy about it and gender gap. From the field work of this thesis in Mozambique and also some previous researches showed that, before giving any solution through technology, this country first needs to take actions for the social issues like: lack of access to ICT, lack of technology usability for women in rural areas, lack of knowledge about sexual violence and gender discrimination (Romão et al., 2007).

And from the findings it showed having regular campaigns on TV, radio, in different places, in schools and providing education will solve issues and will make people aware about sexual violence. Women need to be empowered and encouraged to talk about sexual violence if they face this, they need to be placed in the society as equal as men (Marcelle, 2002). Besides that, poverty is another challenge to use the proposed system, so if the mobile operator of the country make cheap or free for women who are not financially stable and providing cheap smartphone can make women to use this system (RADEMAN, January 2019). Gender gap is one of the major problems; developing countries are facing now, from childhood women have been treated like they are made only for homemaking, taking care of family, children, that's why women are so behind from tech world (Marcelle, 2002). So to change this cultural attitude, again education in schools, free events, campaigns, workshops need to be arranged, after that women would start using technology, they will feel more confident about themselves. And this can reduce the lack of usability of technology in Mozambique and other developing countries like Mozambique, which will make easier for every woman to use the proposed system.

If the field work would have been done a little earlier, if there were enough resources and time for prototype development and if there were enough access of technology, then the

result of this thesis would have been more technical. And those data could have been used for further development. There would be findings from user testing.

After analyzing all data from interview, the results show this proposed system will be very effective if all social and technological issues have been solved before, but that can take several years to implement. And, that can cause more sexual violence cases, so besides working on the issues, the ideal step will be to continue the development of the system in cheaper way, start giving basic education to the illiterate women and have mobile operator services to provide cheaper package to the women who can't afford paying mobile bills. The wristband will be used in everyday life and it will only send messages, calls if any danger situation happens with user, which doesn't happen everyday. So, providing cheaper package at initial stage can be easier for women to use it until the government help to provide free services. And, this way women be more confident and conscious to talk about sexual violence, even if any incident happens it will be reported and then sexual violence can be reduced.

This proposed system can be categorized into innovation and entrepreneurship. Though some research and development have been done earlier, this system not only targeting to be just developed as another digital product, it considers all the social issues that any women in developing countries can face and tries to solve them to use the system in affordable and more accessible way. So, this project focuses on providing a technical smart solution with finding all possible solutions for social and gender issues that women in developing countries are facing. Thus, this research and development work can be also counted as innovative and entrepreneurial work especially for developing countries like Mozambique.

## Conclusion

Sexual violence is one of the most concerning issues in recent years. “According to WHO “Sexual Violence” is any sexual act, that is attempted to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic or otherwise directed against a person’s sexuality using Coercion” (Organization, 2012). Research shows that sexual harassment provides not only insight into a contemporary social problem which affects the quality of women's lives and labor force participation, but also provides an opportunity to test theories concerning the factors affecting organizational behavior (Fain & Anderton, 1987). However, research has yet to fully investigate to reduce sexual violence smartly using technology. In this paper, it has been discussed, this proposed system will be accessible for any developing countries if the social issues have been solved first, illiterate women can also use this system as this has been designed in a simple way and it’s sensor-based. This paper has shown all challenges and possible solutions for a developing country to make technology more accessible for everyone and once those steps will be taken this proposed solution will work as an effective solution for women’s security and this system can be used for other security purposes as well.

For future research of this project and to continue the development of the prototype to make whole system, the next step would be to start working on all the sensors on the device and make it wearable version. For the wristband around the device, any type of fabric can be used as it will make the product cheaper and lighter to wear in daily life. Besides continuing development, it will be also ideal to start providing basic education, training and understanding about technology and creating awareness about sexual violence among women in Mozambique. And taking help from UNFPA, a UN organization in Mozambique can be effective for the basic steps of training. In this way, this proposed system will be affordable and usable to reduce sexual violence.



## References

- Akash, S. A., Al-Zihad, M., Adhikary, T., Razzaque, M. A., & Sharmin, A. (2016). *Hearme: A smart mobile application for mitigating women harassment*. Paper presented at the 2016 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE).
- Akshata, V., Pathan, R., Patil, P., & Nadaf, F. (2014). B'Safe & B'Secure. *International Journal Of Core Engineering & Management (IJCEM)*, 1(7).
- Antonius, R. (2003). *Interpreting quantitative data with SPSS*: Sage.
- Bangali, J., & Shaligram, A. (2013). Design and Implementation of Security Systems for Smart Home based on GSM technology. *International Journal of Smart Home*, 7(6), 201-208.
- Chair, C. (Apr 4th, 2019). Assessing demand side trends in ICTs at the household, individual and business levels. RIA Policy Paper No. 6, Vol. 5, After Access: The state of ICT in Mozambique. Retrieved from <https://researchictafrica.net/2019/04/04/ict-in-mozambique/>
- Chatzoglou, P., & Chatzoudes, D. (2018). The role of innovation in building competitive advantages: an empirical investigation. *European Journal of Innovation Management*, 21(1), 44-69.
- Chisnell, D., & Redish, J. (2005). *Designing web sites for older adults: Expert review of usability for older adults at 50 web sites* (Vol. 1): AARP San Francisco.
- Chougula, B., Naik, A., Monu, M., Patil, P., & Das, P. (2014). Smart girls security system. *International Journal of Application or Innovation in Engineering & Management*, 3(4).
- Dimond, J. P., Dye, M., LaRose, D., & Bruckman, A. S. (2013). *Hollaback!: the role of storytelling online in a social movement organization*. Paper presented at the Proceedings of the 2013 conference on Computer supported cooperative work.
- Elias, T. (2011). Universal instructional design principles for mobile learning. *The International Review of Research in Open and Distributed Learning*, 12(2), 143-156.
- Ellsberg, M. C., & Heise, L. (2005). *Researching violence against women: a practical guide for researchers and activists*.
- Fain, T. C., & Anderton, D. L. (1987). Sexual harassment: Organizational context and diffuse status. *Sex Roles*, 17(5-6), 291-311.
- García-Moreno, C., & Organization, W. H. (2005). WHO multi-country study on women's health and domestic violence against women: initial results on prevalence, health outcomes and women's responses.
- Godin, B., Lucier, P., & sur la Culture, C. F. D. (2012). Innovation and Conceptual Innovation in Ancient Greece. *Project on the Intellectual History of Innovation*, 1-31.
- Hariprasath, L., Dhivya, R., & Adithya, S. . (2013). Emergency Alert System using Android. *IJREAT International Journal of Research in Engineering & Advanced Technology*. 1(1), 6-26. .
- Helen, A., Fathila, M. F., Rijwana, R., & Kalaiselvi, V. (2017). *A smart watch for women security based on iot concept 'watch me'*. Paper presented at the 2017 2nd International Conference on Computing and Communications Technologies (ICCCT).
- Imrie, R. (2012). Universalism, universal design and equitable access to the built environment. *Disability and rehabilitation*, 34(10), 873-882.
- Jewkes, R., Sen, P., & Garcia-Moreno, C. (2002). Sexual violence.
- Liu, J., Chen, C., Ma, Y., & Xu, Y. (2013). *Energy analysis of device discovery for bluetooth low energy*. Paper presented at the 2013 IEEE 78th Vehicular Technology Conference (VTC Fall).
- Luchetti, G., Serviçi, G., Frontoni, E., Mancini, A., & Zingaretti, P. (2013). *Design and test of a precise mobile GPS tracker*. Paper presented at the 21st Mediterranean Conference on Control and Automation.
- Mabila, F. (2013). Understanding what is Hapening in ICT in Mozambique: A Supply-and Demand-side Analysis of the ICT Sector.

- Mace, R. (1988). Universal design: housing for the lifespan of all people. *The Center for Universal Design, Nort Carolina State University*.
- Mahajan, M., Reddy, K., & Rajput, M. (2016). *Design and implementation of a rescue system for safety of women*. Paper presented at the 2016 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET).
- Mahmud, S. R., Tumpa, S. N., Islam, A. B., Ferdous, C. N., Paul, N., & Anannya, T. T. (2017). *BONITAA: A smart approach to support the female rape victims*. Paper presented at the 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC).
- Marcelle, G. (2002). *Gender Equality & ICT Policy*. Paper presented at the Presentation at World Bank Digital Divide Seminar Series, Washington, DC <http://www.worldbank.org/gender/digitaldivide/worldbankpresentation.ppt>.
- Muggah, R., & Krause, K. (2009). Closing the gap between peace operations and post-conflict insecurity: Towards a violence reduction agenda. *International Peacekeeping*, 16(1), 136-150.
- Muianga, X., Hansson, H., Nilsson, A., Mondlane, A., Mutimucuo, I., & Guambe, A. (2013). ICT in education in Africa-myth or reality: A case study of Mozambican higher education institutions. *The African Journal of Information Systems*, 5(3), 5.
- NSD. Notification Form for research projects processing personal data.
- Opdenakker, R. (2006). *Advantages and disadvantages of four interview techniques in qualitative research*. Paper presented at the Forum Qualitative Sozialforschung/Forum: Qualitative Social Research.
- Organization, W. H. (2012). *Understanding and addressing violence against women: Sexual violence*. Retrieved from
- Organization, W. H. (2014). *Violence against women: Intimate partner and sexual violence against women: Intimate partner and sexual violence have serious short-and long-term physical, mental and sexual and reproductive health problems for survivors: Fact sheet*. Retrieved from
- Patel, J., & Hasan, R. (2018). *Smart bracelets: Towards automating personal safety using wearable smart jewelry*. Paper presented at the Consumer Communications & Networking Conference (CCNC), 2018 15th IEEE Annual.
- RADEMAN, A. G. O. M. B. (January 2019). The state of ICT in Mozambique. . Retrieved from [https://researchictafrica.net/2019\\_after-access\\_the-state-of-ict-in-mozambique/](https://researchictafrica.net/2019_after-access_the-state-of-ict-in-mozambique/)
- Romão, F., Mabunda, L., Buque, C., Samo, G., & Barca, O. (2007). Violence against women in Mozambique. *UNIFEM issue paper*.
- Roy, S., Sharma, A., & Bhattacharya, U. (2015). *MoveFree: A ubiquitous system to provide women safety*. Paper presented at the Proceedings of the third international symposium on women in computing and informatics.
- Sarosh, M. Y., Yousaf, M. A., Javed, M. M., & Shahid, S. (2016). *Mehfoozaurat: Transforming smart phones into women safety devices against harassment*. Paper presented at the Proceedings of the Eighth International Conference on Information and Communication Technologies and Development.
- Schneider, K. T., Pryor, J. B., & Fitzgerald, L. F. (2010). Sexual harassment research in the United States. In *Bullying and Harassment in the Workplace* (pp. 261-282): CRC Press.
- Secretariado Executivo da Comissão para a Política de Informática. (2002).
- UCI , o. o. r. Retrieved from <https://www.research.uci.edu/compliance/human-research-protections/researchers/privacy-and-confidentiality.html?fbclid=IwAR1pGFQzAhLNWRKFSfIPgWA2dzSPI1YfkZDse-D6VpPOP4e5-fuTgQkGFfc>
- Ulatius. (December, 2016). A Brief Guide to Ethics for Interpreters and Translators. Retrieved from <https://www.ulatus.com/translation-blog/a-brief-guide-to-ethics-for-interpreters-and-translators/>

UNDP. (2008). Mozambique National Human Development Report 2008: The Role of Information Communication

Technology in Achieving the Millennium Development Goals. Southern African Research and Documentation Centre

(SARDC), Mozambique.

Viswanath, K., & Basu, A. (2015). SafetiPin: an innovative mobile app to collect data on women's safety in Indian cities. *Gender & Development*, 23(1), 45-60.

Viswanath, N., Pakyala, N. V., & Muneeswari, G. (2016). *Smart foot device for women safety*. Paper presented at the 2016 IEEE Region 10 Symposium (TENSYPMP).

Women. (2011). Safe Cities Free of Violence Against Women and Girls Initiative. . *Report of the Baseline Survey Delhi 2010*. .

Yarrabothu, R. S., & Thota, B. (2015). *Abhaya: An Android App for the safety of women*. Paper presented at the 2015 Annual IEEE India Conference (INDICON).

# Appendices

## Mobile application development via MIT2 app inventor

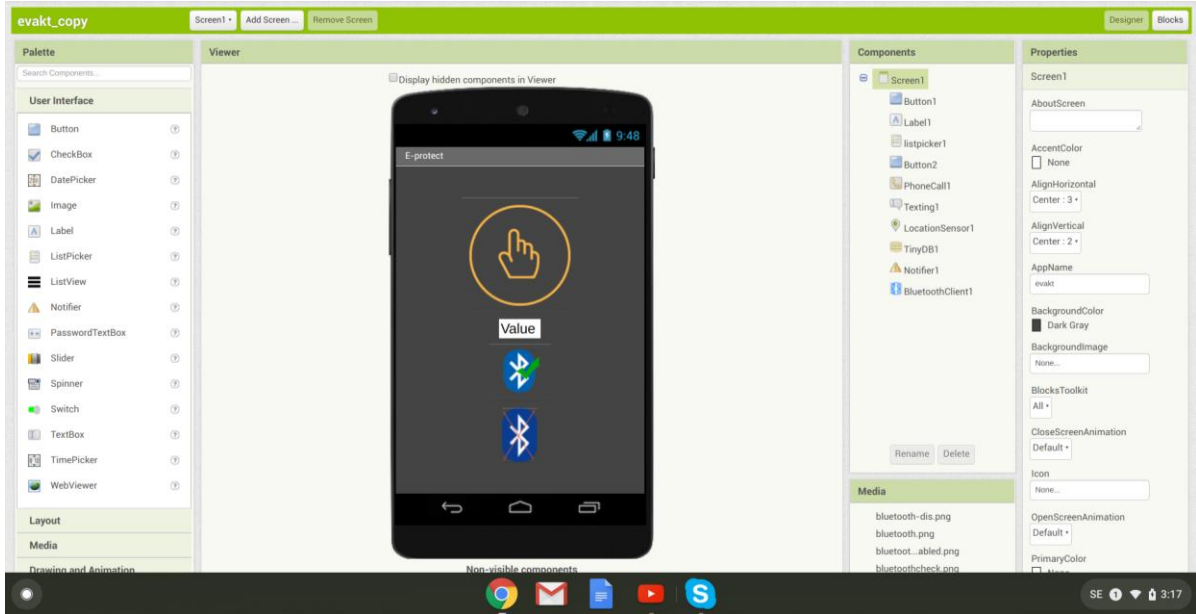


Figure 5: Screenshot of MIT2 app inventor where mobile application has been developed.

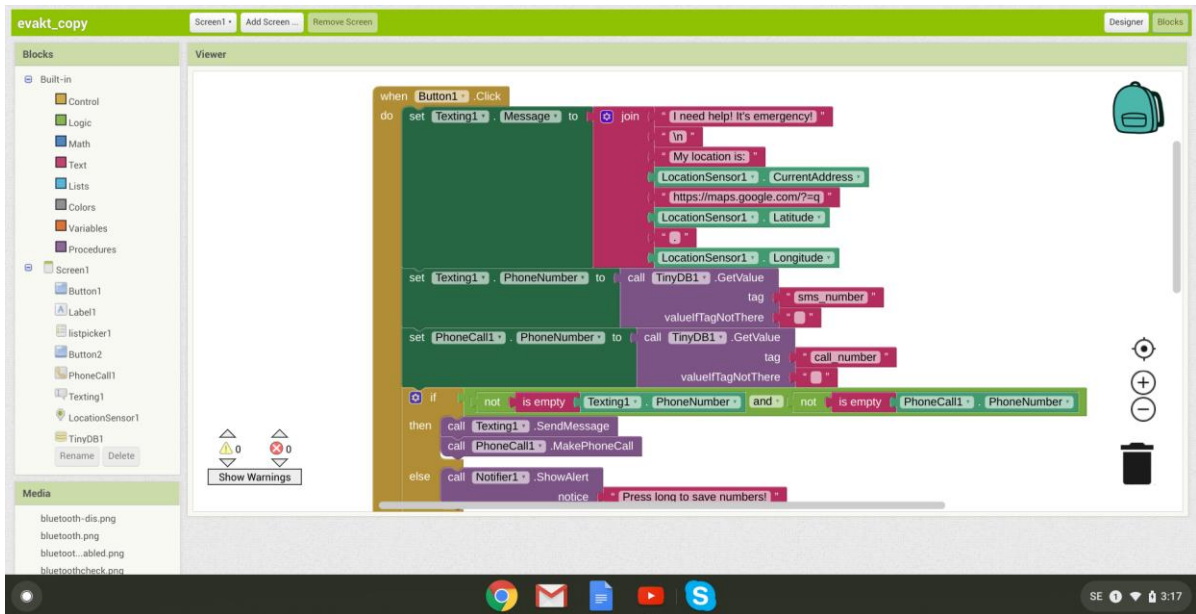


Figure 6: Another screenshot of MIT2 app inventor coding section where mobile application has been developed.

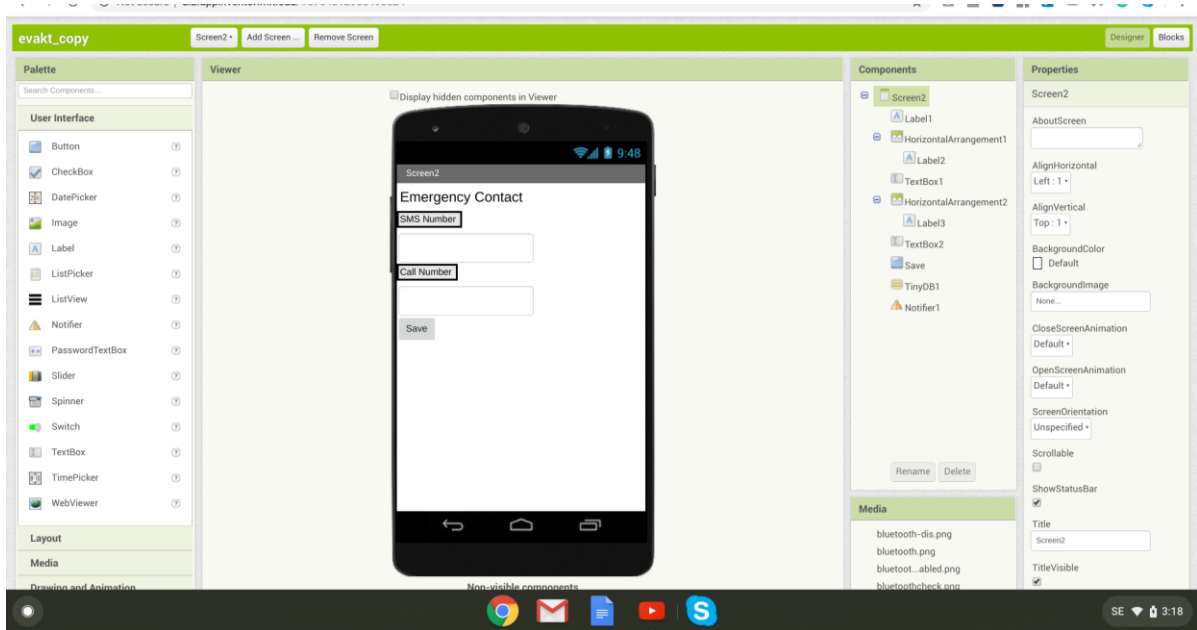


Figure 7: Screenshot of MIT2 app inventor of mobile application for number registering.

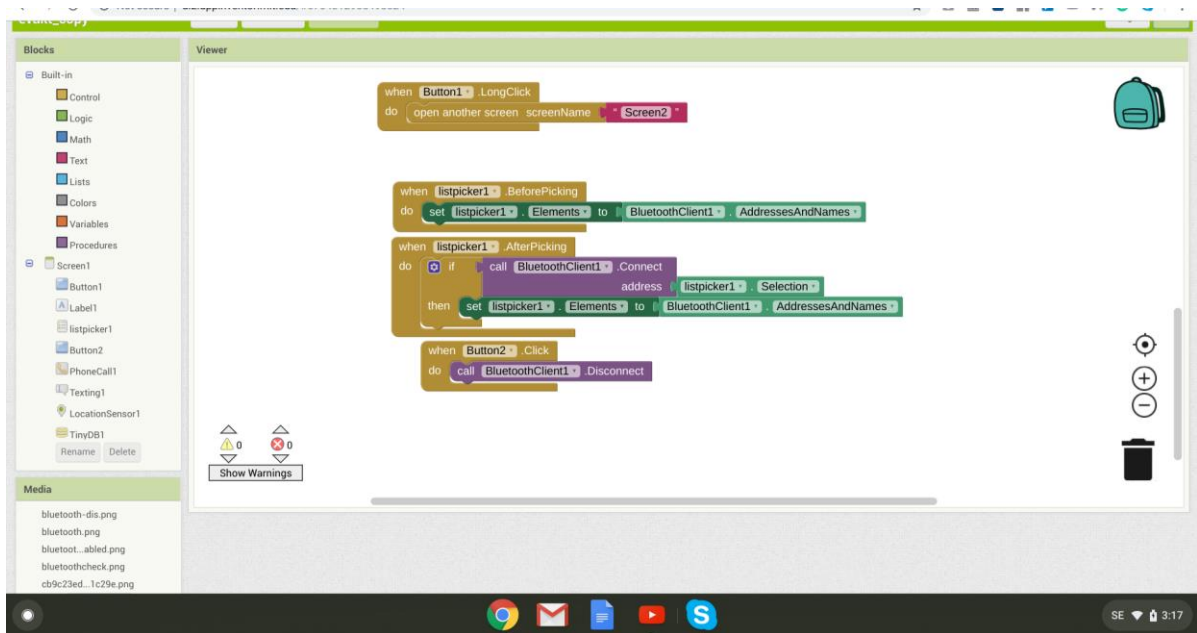


Figure 8: Another screenshot of MIT2 app inventor coding part for Bluetooth connection.

## Interview guide

10. Interview with people generally to get feedback in context Mozambique:-
11. What is the current situation in Mozambique regarding women harassment? Is it a case that almost happening every day or sometimes? Also in context of women with disabilities?

12. What kind of harassment happens most in Mozambique you think? Is it street, office or in family etc?
13. What should be the best approach in your opinion to solve this issue?
14. What kind of awareness they should take so that they can save themselves in these situations?
15. What do you think about the majority of women use smartphones in Mozambique? In context of women with disabilities?
16. Do you have any idea, thoughts about any organization in Mozambique who are working for women with disabilities?
17. What kind of technology you think, they are using for assisting women with disabilities? If any
18. What kind of barriers you think women with disabilities will face during using this system in Mozambique?

## **Consent letter**

### **Are you interested in taking part in the research project**

#### ***Reduce Women Harassment Smartly Trough Technology***

This is an inquiry about participation in a research project where the main purpose is to give a solution to women so that they can go out safely and if they get in any danger situation they can ask help via technology. In this letter we will give you information about the purpose of the project and what your participation will involve.

#### **Purpose of the project**

The purpose of the project to reduce women harassment smartly using a wristband, which will be connected to a mobile application via bluetooth and in the wristband there will be sensors. So that when someone in danger and their body temperature, heart rate got high the sensors get activated and send message to the registered emergency contact person with current location of the user.

This project is a Master's thesis project and in this project there will be research and some technical development.

#### **Who is responsible for the research project?**

Oslo Metropolitan University is the institution responsible for the project.

#### **Why are you being asked to participate?**

The reason to participate is to take some interviews with women to see how the system can work and what are the possibilities need to improve and analysing the collected data.

### **What does participation involve for you?**

There will be face to face interviews. The participants will be mainly women and women with disabilities, the data will be collected generally about harassment, technology usability.

### **Participation is voluntary**

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

### **Your personal privacy – how we will store and use your personal data**

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentiality and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- The collected data only be used for the Master's thesis, it will not be shared with anyone.
- The only will be shared with student of this project.

### **What will happen to your personal data at the end of the research project?**

The project is scheduled to end approx. 31.12.2022. At the end of project the data will be deleted because the data is just to improve the system of the project.

### **Your rights**

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

### **What gives us the right to process your personal data?**

We will process your personal data based on your consent.

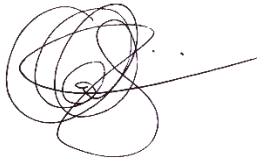
Based on an agreement with *Oslo Metropolitan University*, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

### **Where can I find out more?**

If you have questions about the project, or want to exercise your rights, contact:

- *Oslo Metropolitan University* via *George Anthony Giannoumis and Sadiha Haque* (Masters student)
- Our Data Protection Officer: [ingrid.jacobsen@oslomet.no](mailto:ingrid.jacobsen@oslomet.no)
- NSD – The Norwegian Centre for Research Data AS, by email: ([personverntjenester@nsd.no](mailto:personverntjenester@nsd.no)) or by telephone: +47 55 58 21 17.

Yours sincerely,



Project Leader  
(Researcher/supervisor)

Sadiah Haque

Stu

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## Consent form

I have received and understood information about the project to reduce women harassment smartly through technology and have been given the opportunity to ask questions. I give consent:

- to participate in face to face interview.
- I agree to collect my data using the app/wristband.

I give consent for my personal data to be processed until the end date of the project, approx.

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(Signed by participant, date)