



**PRESENTATION REPORT**

# INVISA

**A lifeline for victims of stalking**

**Aalborg University - MSc04  
Industrial Design - Team 15**

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**DESIGNOH**  
Unique user experiences



# TITLE PAGE

<b>Title</b>	INVISA
<b>Theme</b>	A lifeline for victims of stalking
<b>Project period</b>	February 1 <sup>th</sup> . 2017 - May 18 <sup>th</sup> . 2017
<b>Project team</b>	DesignOH - MSc04 - ID15
<b>Main supervisor</b>	Nis Ovesen
<b>Co-supervisor</b>	Erik Appel Jensen
<b>Pages</b>	24 pages
<b>Characters</b>	997

## Design team:

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## INTRODUCTION

This project is based on personal experiences with personal alarms in a number of traumatic experience. Research showed that other victims experienced some of the same issues. The biggest issue is personal alarms often isn't used in emergency situations because it isn't possible to call for help without the perpetrator knowing.

Research showed victims:

- Feel they have lost control of their life
- Can't reach help in emergency situations
- Don't have overview of their opportunities
- Waist a lot of time collecting technical evidence
- Feel alone and think their situation is unique

After reflected on the discovered issues the team found a potential to create a collected solution which makes victims feel powerful in a higher degree take the back the control in their life. A life line they can reach when needed and at the same time invisible to their surroundings.

**“ I didn't use my personal alarm, when my former boyfriend held a gun to my head because it makes a sound when I activate it. I was afraid he would kill me if he discovered me. ”**

- Victim of stalking



**DESIGNOH**  
Unique user experiences



## VICTIMS OF STALKING

In Denmark about 100.000 people are exposed to stalking and 36.900 of them by an former partner or cohabit.

Their life are impact by repeated abuses, uncertain about when the next attack will happen and how to handle it. Therefore victims feel they have lost control of their life to the perpetrator.

In situations with physical abuses the perpetrator will do everything possible to remove the victims possibility to reach help. If the victim try to reach help, and the perpetrator finds out there is a risk the situation will escalate. Therefore victims are afraid to call for help in the situation even though they have a phone in their hand.

Victims are often socially isolated and believe their situation is unique. Victims is mentally effected by their situation which results in a low surplus of mental resources and stress. They have a hard time focusing on performing tasks and to get the overview of the offers for help.

Victims spend hours on collecting technical evidence to the Police. Stalking cases often ends without a judgement. If the perpetrator gets a judgment they often continue their actions without thinking of the consequences. Therefore stalking cases often last for many years and results in victims feeling left alone and no one is able to help them out.

**“ We can’t shorten the timespan of stalking cases, but there was a potential to make victims take more control of their situation and feel more safe**

**100.000-132.000**

people in Denmark are exposed to stalking every year.

**Long timespan**

Statistically stalking cases span from 1-16 years, but some cases continue for the rest of the victims life.



**“ I don’t feel safe in my own home. I feel like he can see me everywhere**

### SUB PROBLEMS



**Can’t reach help in emergency situations**



**Collecting technical evidence is energy consuming**



**Can’t get overview of their opportunities**



**Feel alone**



**Lost the control of their life**



**Low surplus of mental resources**



#### Emergency situations

The perpetrator expose the victim to physical and/or sexual abuses. The victim have a short and limited ability to reach help.

Victims often doesn’t call for help because they can’t do it without the perpetrator find out and are afraid the consequence will be they get killed.



#### Imprisoned

The victim is imprisoned either by the perpetrator or because they seek for safety from the perpetrator.

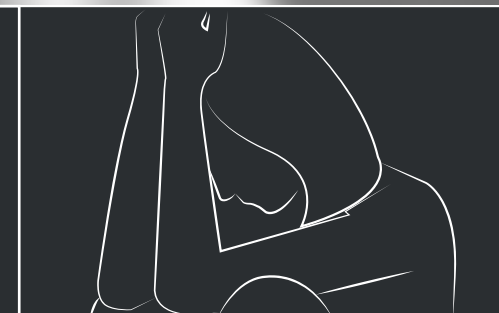
In this situation they often have time to make decisions and plan how to get away.



#### Assault from afar

The victim isn’t in directly contact with the perpetrator.

This can be by threats on email, messages, phone calls, burnings of their house, damages their personal belongings or followed by the perpetrator. The perpetrator shows up at their home, at work or other locations where they often show up.



#### Moment of uncertainty

In the time between the assaults victims deal with worries about when next situation will happen and how to handle and escape it. They are often alone and believe no one is in the same situation.



# INVISA - an wearable lifeline

INVISA makes stalking victims able to handle their own situation. It is a life line they can bring along in their every day life.

The solution consists of an wearable alarm, application and support from helping organizations, Women Shelters, the Police and/or security companies.

The wearable alarm looks like a watch and a ring. It gives victims the power to reach help in a emergency situation without the perpetrator finds out.

The service provides easier collection and storage of technical evidence and a community for victims where they can build relations to people in a similar situation.



## CORE VALUES



Discreet and quick reach of help in emergency situations



Less energy on collecting and handling technical evidence



Collected overview of helping opportunities



Communicate with victims and experience people in a similar situation



Power to handle their own situation



A life line in reach

### Wearable alarm

### Application

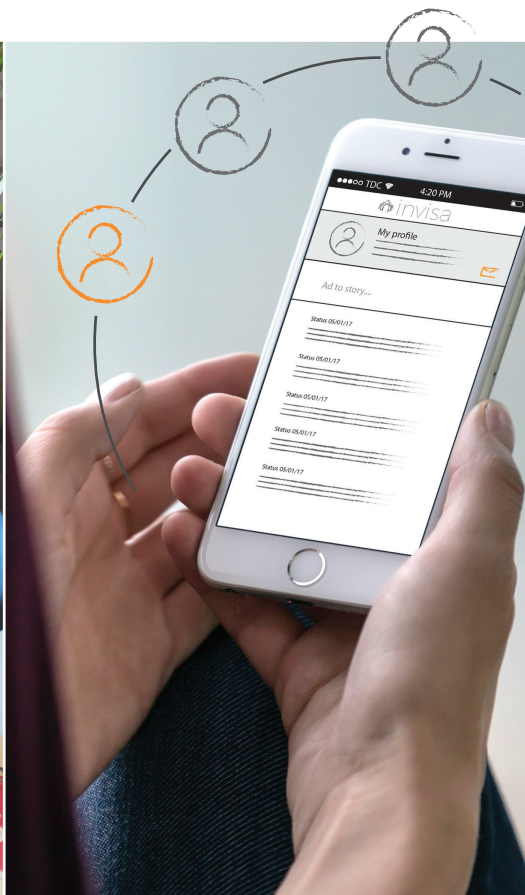
COMPLETE SOLUTION FOR VICTIMS OF STALKING



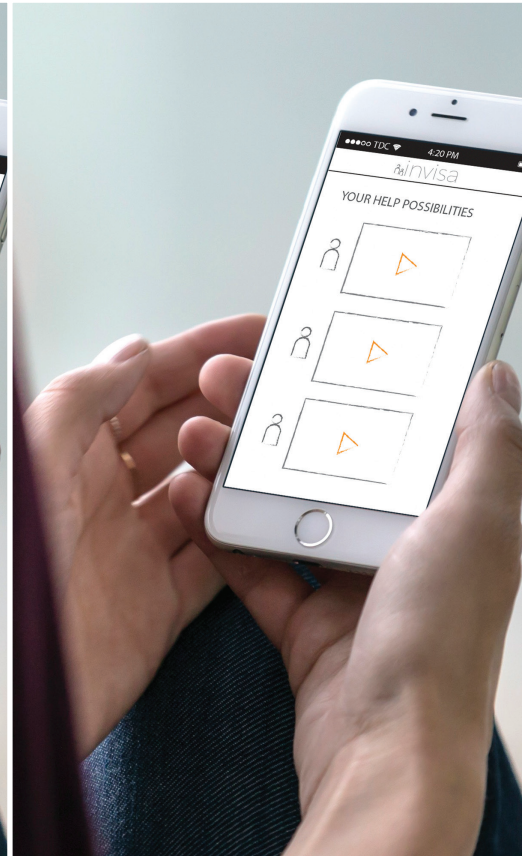
# USE OF INVISA



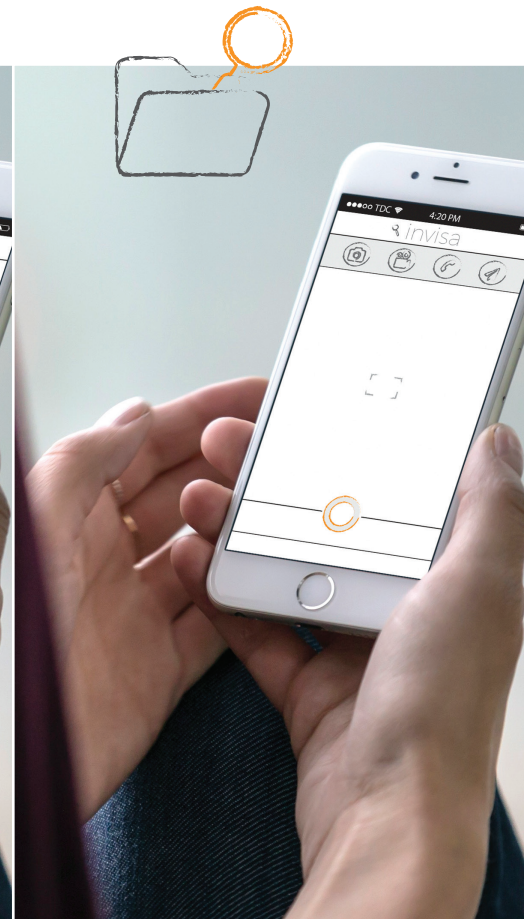
**Start up**  
The victim gets a alarm and a personal account. Through the start up they can get support from INVISAs channels.



**Controlled community**  
A community where victims of stalking can communicate and share experiences.



**Overview of helping opportunities**  
Small videos provide victims with an overview of their helping opportunities.



**Technical evidence**  
Produce, store and send evidence through the application.



**Reach help**  
Quick reach help in emergency situations by two clicks on the ring without the perpetrator recognise.



**On spot guidance**  
Getting on-spot guidance in less critical situations.



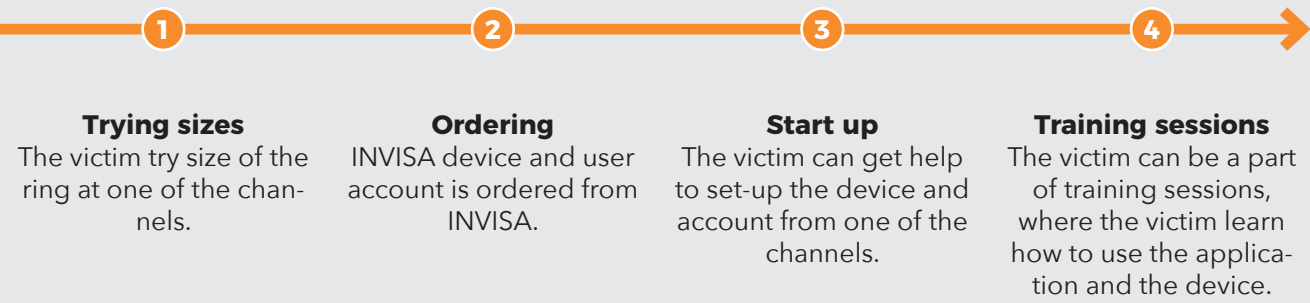
# UP-STARTING SCENARIO

Today helping organizations, Police, Women Shelters and security companies are in contact with users. These actors provide victims for INVISA and can support them setting the device and application up.

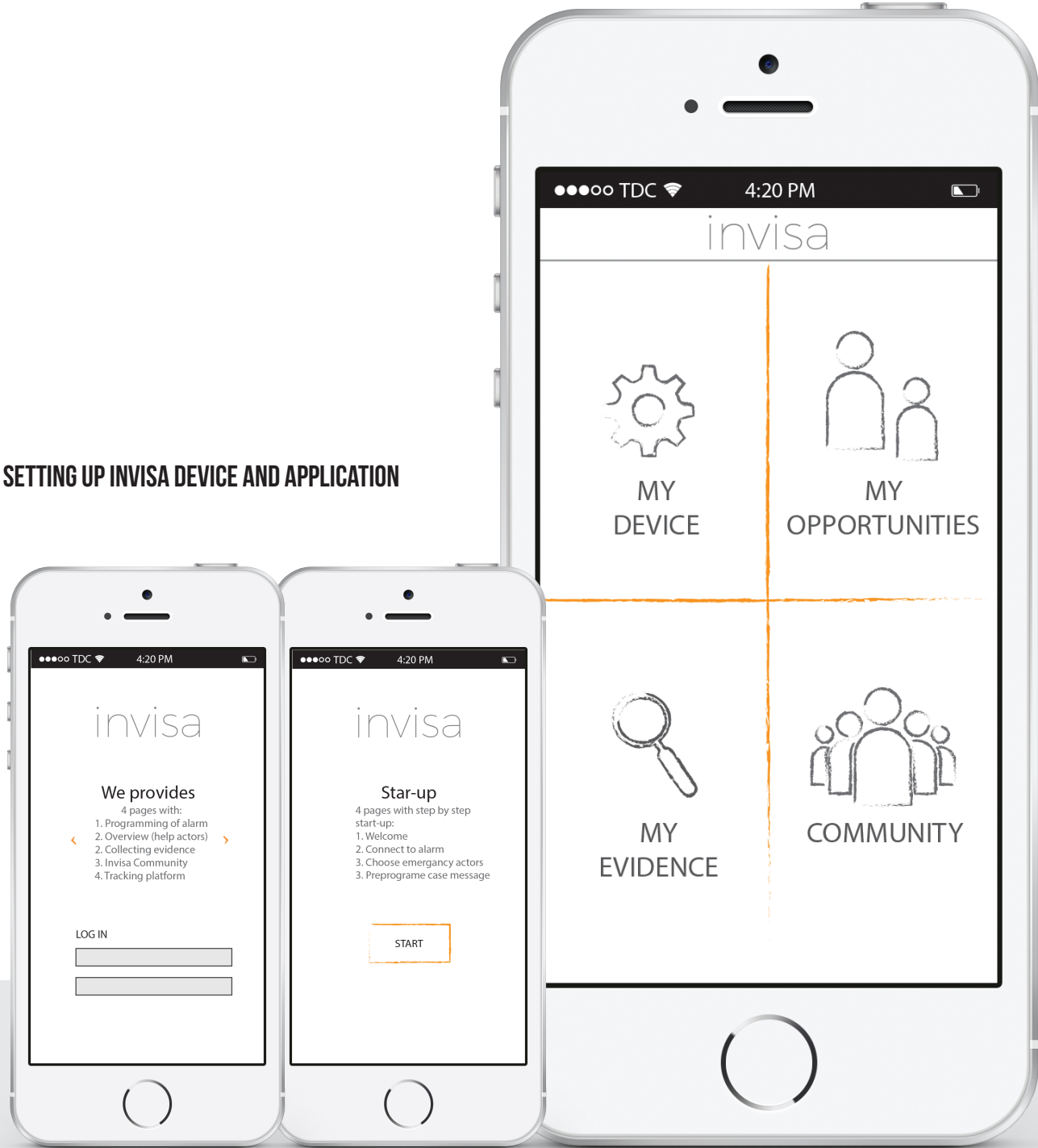
CHANNELS

Helping organizations  
Women Shelters  
Security companies  
Police

## UP-STARTING SCENARIO



## SETTING UP INVISA DEVICE AND APPLICATION



**Log-in**  
Overview of what INVISA provide and log-in page.

**Introduction**  
First time the victim use the application there will be an introduction to the application.

**Homepage**  
A simple homepage showing the 4 categories.

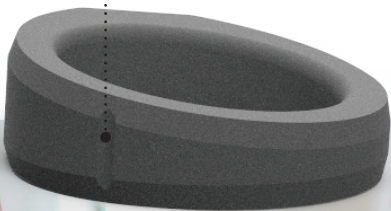


# DISCREET REACH FOR HELP

Victims have less worries in their every day life when knowing they can reach help without the perpetrator will find out.

Not all victims want to involve the Police. INVISA device makes the victim able to choose who the alarm should call through the application.

Button



## DISCREET EMERGENCY CALL

A emergency call the surroundings doesn't recognize.



### No sound

The emergency actor can hear the situation, but the victim can't hear them.



### Discreet motion

Activation by pushing a button two times at the ring. It is possible with locked arms.



### Vibration

Vibrations tells the victim the call is activated and processing.



## ON-SPOT GUIDANCE

Sound can be turned on when the emergency is over or in case of a mistaken call.



### Turn sound on

Pressing two buttons at the same time on the watch.



## APPLICATION FOR PRIVATE EMERGENCY ACTOR

Emergency actor is on the way.



### Live tracking of victim

The emergency actor can follow the victims location.



### Turn sound on and off

Choose if they can hear the sound or not.



### Navigation

The application show the way to the victim.

## DATA FLOW



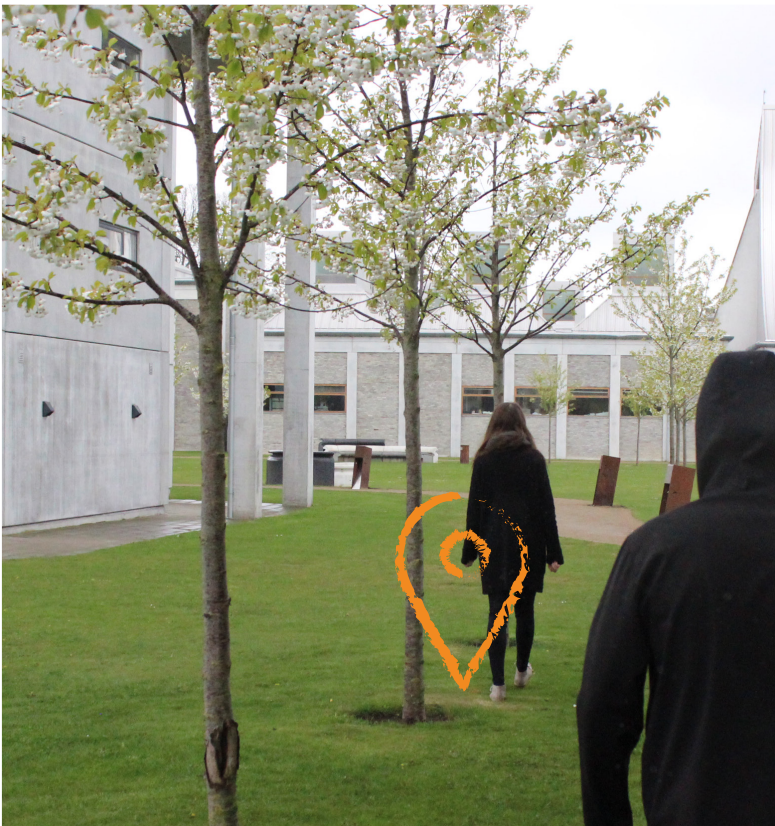
**Victim in an emergency situation**  
Activating emergency call

**Primary emergency actor**  
The primary actor can be the emergency centre, friends, family, or an other person the victim trust.

**Secondary emergency actors**  
Persons victim trust.



# TRACKING IN-AND OUTDOOR



## TRACKING OUTDOOR

To track the victim's location outdoor the device is using the **GSM** and **GPS** net depending on which signal is strongest.



## TRACKING INDOOR

GSM and GPS can have problems by reaching indoor. In those cases INVISA switch to use WiFi. INVISA can be connected to **WiFi** spots on locations where the user often is located.

# ADJUSTABLE ACCORDING TO STATE OF MIND

There are periods where victims feel more in risk of being abused then others.



## FEELING EXPOSED

When victims feel exposed, the victim can wear INVISA device.



## FEELING SAFE

The victim doesn't want to be reminded of being a victim.

### Quick interaction

The emergency actor can hear the situation, but the victim can't hear them.

### Wearing

Activation by a small discreet motion which is possible with locked arms.

### Leave the ring alone

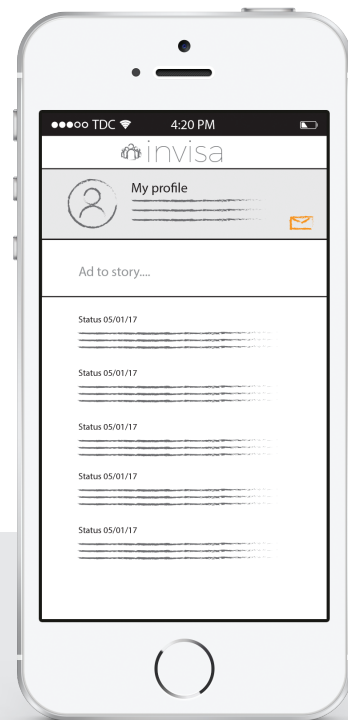
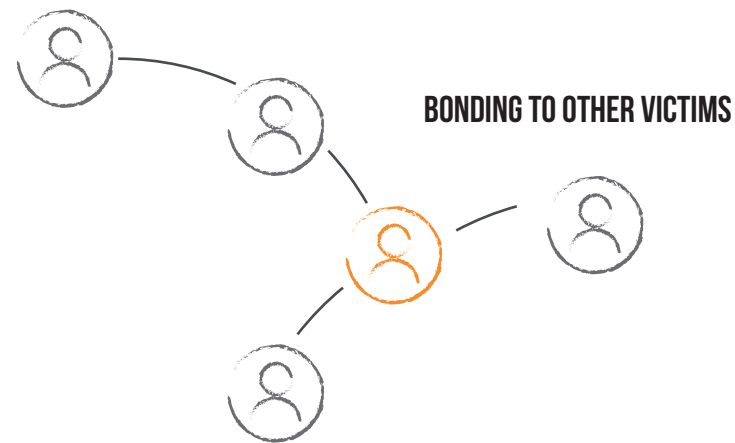
The emergency call can be activated on the watch.

### In the bag

Less quick interaction.

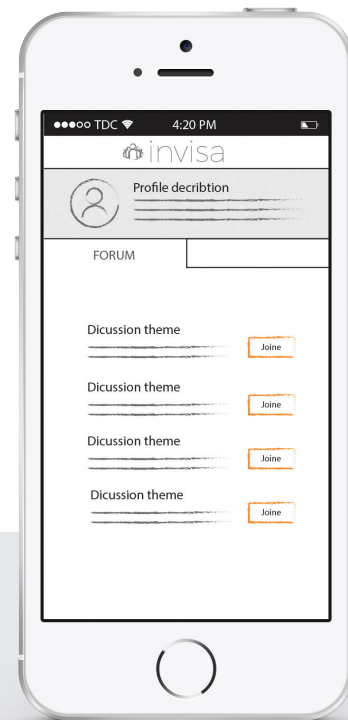


## COMMUNITY FOR STALKING VICTIMS



### Profile

Each user have a personal profile where they can shear their story and experiences. The user choose if they are anonymous or not, depended on their situations.



### Forum

The users can ask questions and create discussion with each other in a common forum.



### Personal chat

Users can build relations to other victims by communicating more privately. If there is a person who they doesn't feel comfortable with they can block the person.

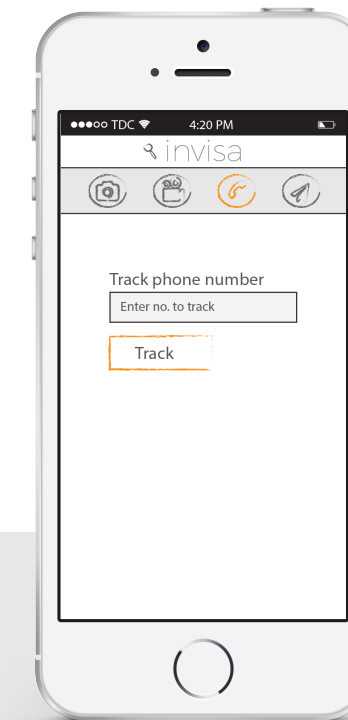
## TECHNICAL EVIDENCE

### PRODUCING AND STORAGE OF TECHNICAL EVIDENCE



### Evidence collection

Users can take pictures, videos. Once it is taken it is stored in their evidence library with date and time.



### Tracking a phone no.

The application can track how many times a specific phone no. is calling and record the sound.



### Evidence library

The victim can send their evidence to the police by e-mail through the App. The victim choose if they want to send all or deselect some of them.



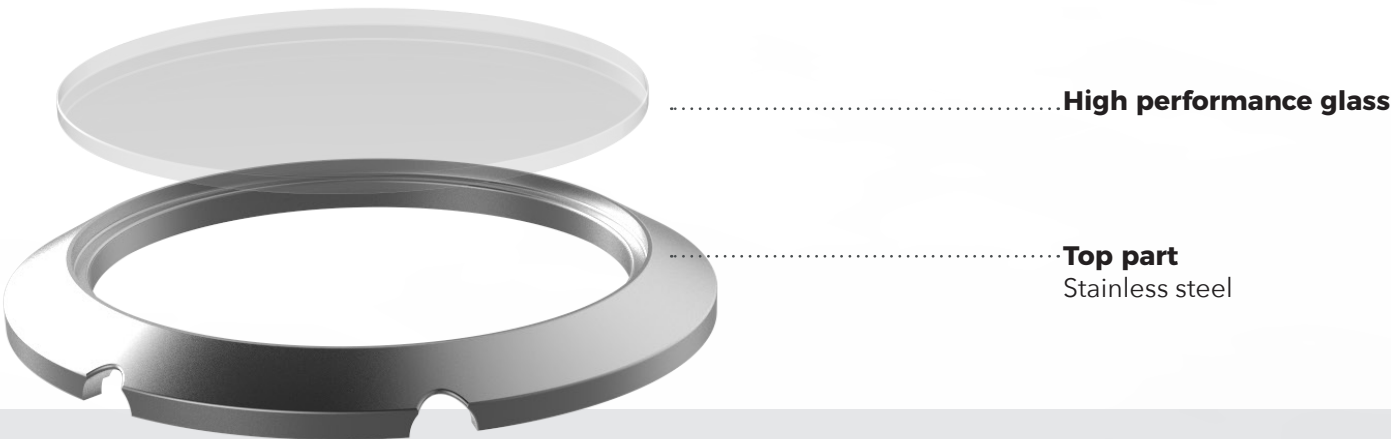
CONSTRUCTION

DESIGNED WITH FOCUS ON

Impact resistance

Water resistance

Minimal amount of conductive materials to create a stronger signal for the antennas



High performance glass

Top part  
Stainless steel



Clockwork

Speaker  
AAC091B

Vibrator  
LRA Y625

PCB  
On the PCB with implemented antenna and electrical components modules: Wifi, G-sensor, GMS, CPU, GPS, Embedded SIM, Wireless charging, Antenna.

Battery  
Rechargeable 3.7V, 450mAh

Seal  
Water resistance

Buttons

ABS shell

Leather straps

Outer shell

12 sizes. The insert glues into the outer shell to make sure it is fixed.

Silicone

The silicone feels soft and comfortable to wear. It minimizes the risk of rotation on the finger.

Insert with components

The insert with the inner components fits to 11 outer shell sizes. Felt with silicone makes it resist to water.

Battery

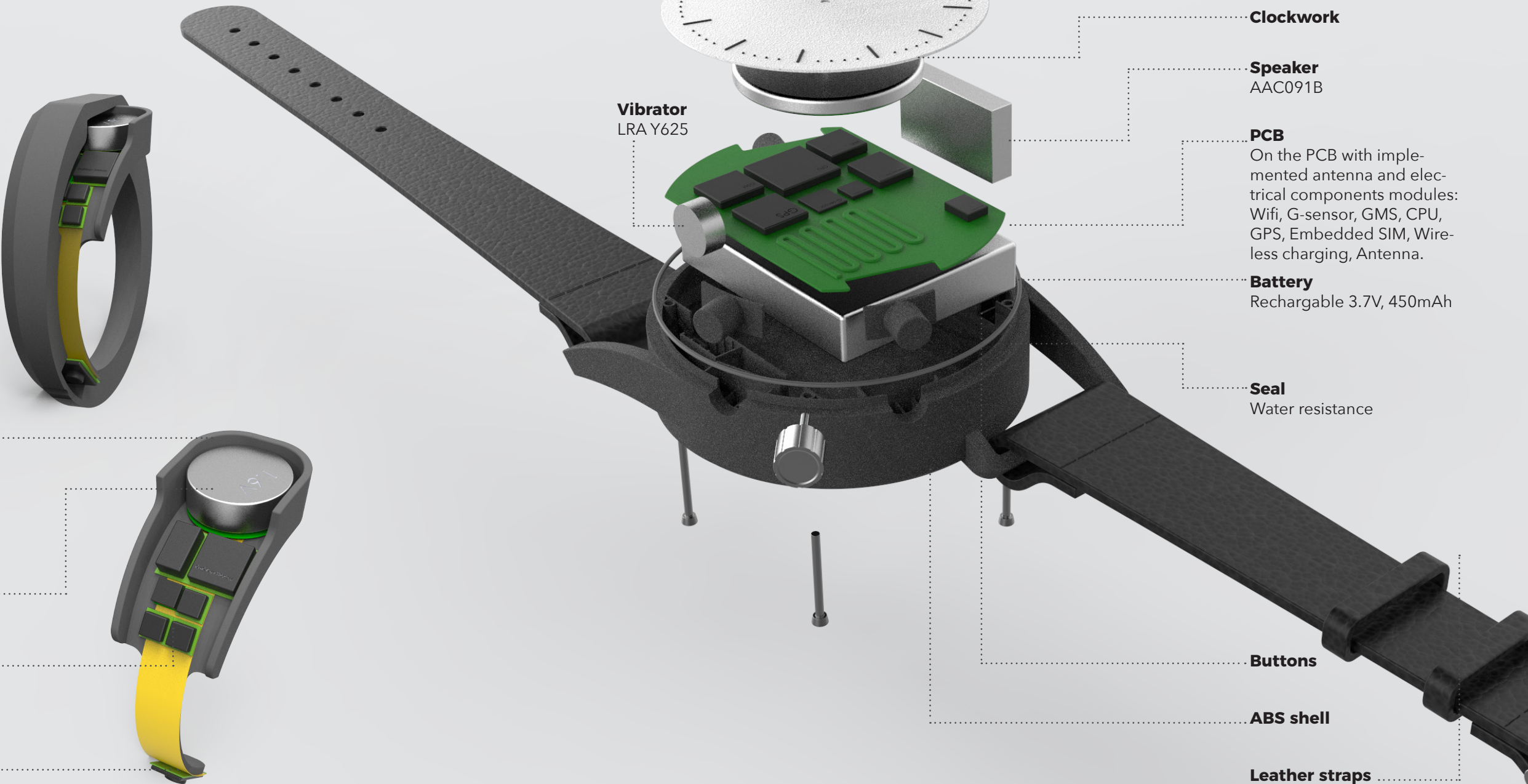
Rechargeable 1,6V battery

555 timer

The three 555 timer sends a coded radio frequencies to the watch.

Water proof switch

The switch is waterproof.



POWER

The device is charged by wireless charging.

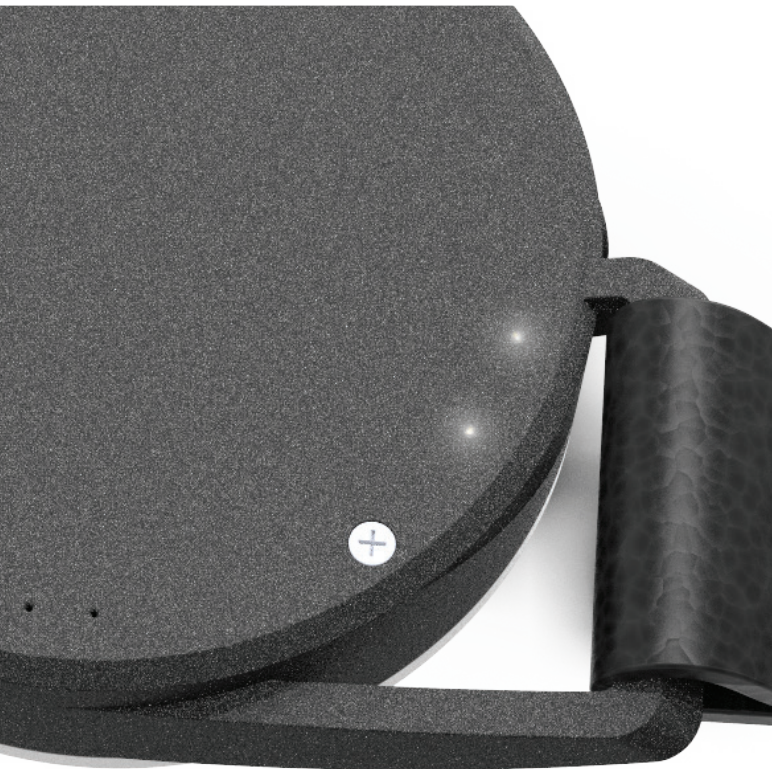
BATTERY LIFE

**Ring:**  
38 days standby

**Watch:**  
5 days standby  
3 hours calling



**Wireless Charging**  
Wireless charging makes it possible to create clean surfaces on the devices.

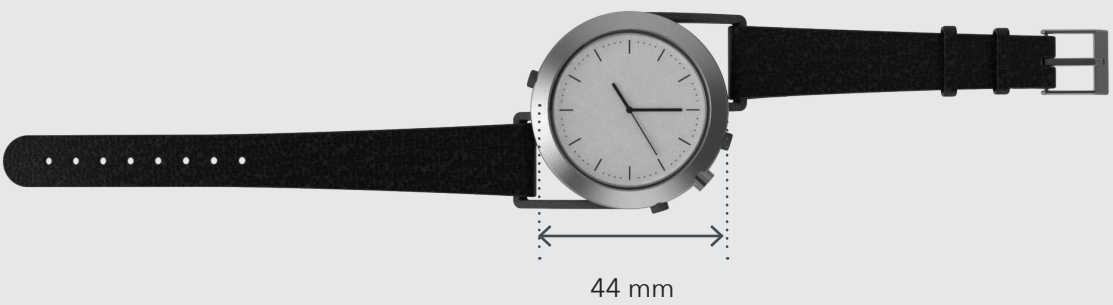
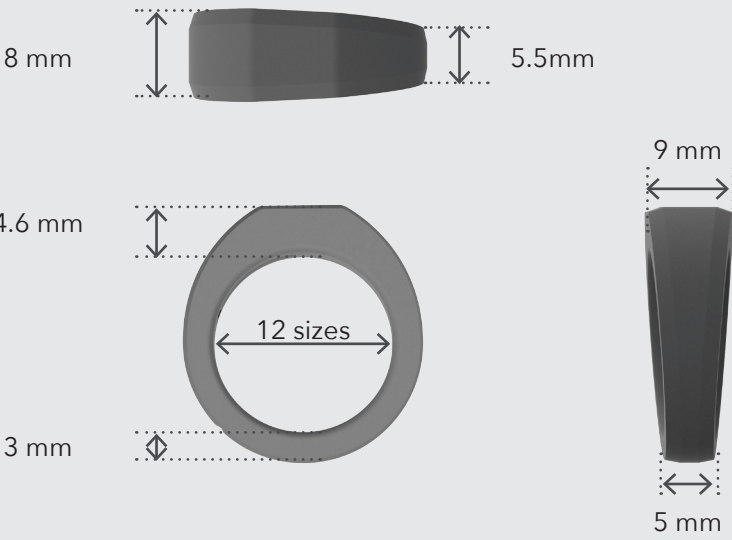


**Power level indication**  
The battery level for both the watch and the ring, are indicated by LED at the watch.



**Quick interaction**  
In case of emergency it is easy and quick for the user to grab the device. The victim can sleep with the ring on while the watch is charging.

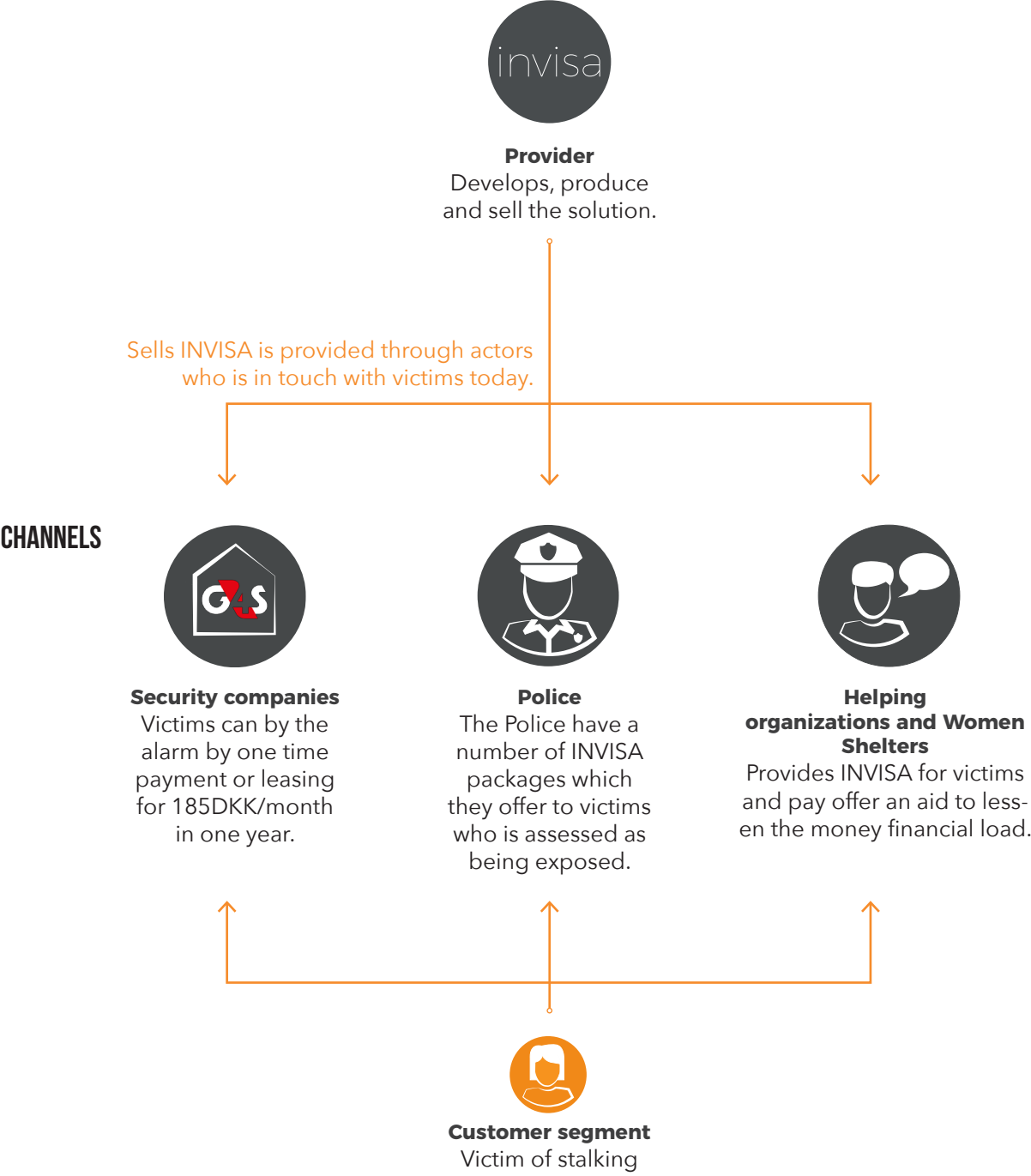
DIMENSIONS





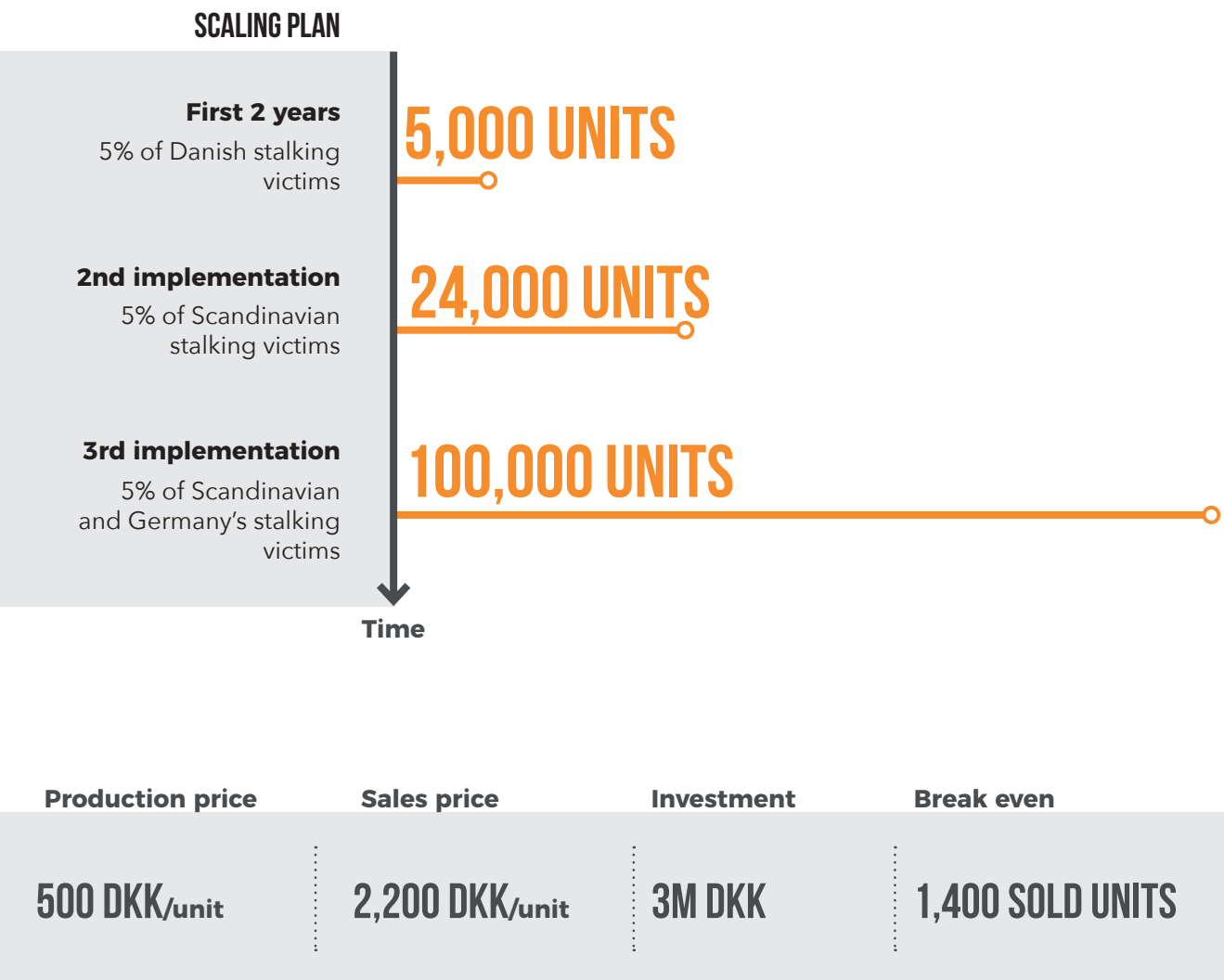
BUSINESS CASE

To reach the victims INVISA should establish partnerships with organizations who is in contact with victims. INVISA produce and distribute the solution to security companies, the Police and victims. Advertising of INVISA needs to be discreet so the perpetrator has a minimal knowledge of INVISA.



ECONOMY

The number of victims of stalking in Denmark is approximately 100.000. The first two years INVISA's ambition is to reach 5% of the market in Denmark. Depending on the demand, there is a potential to scale the market to countries with a similar culture: Germany and the Scandinavian countries.





## **Architecture and Design**

Aalborg University · Industrial Design · MSc04 - ID15





PROCESS REPORT

# INVISA

A lifeline for victims of stalking

**Aalborg University - MSc04  
Industrial Design - Team 15**

Janne Bjerregaard Thomsen  
Josefine Vestergaard Jørgensen



TITLE PAGE

Title	Personal safety
Theme	Safety and comfortability for victims of long term stalking
Project period	February 1 <sup>th</sup> . 2017 - May 18 <sup>th</sup> . 2017
Project team	DesignOH - MSc04 - ID15
Main supervisor	Nis Ovesen
Co-supervisor	Erik Appel Jensen
Pages	100 pages
Characters	164,510
Worksheets	124

Design team:

Janne Bjerregaard Thomsen

Josefine Vestergaard Jørgensen



INTRODUCTION

This project is based on personal experiences with personal alarms in a number of traumatic experience. Research showed that other victims experienced some of the same issues. The biggest issue is the personal alarm often isn't used in emergency situations because it isn't possible to call for help without the perpetrator knowing.

Research showed victims:

- Feel they have lost control of their life
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- Don't have overview of their opportunities
- Waist a lot of time collecting technical evidence
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After reflected on the discovered issues the team found a potential to create a collected solution which makes victims feel powerful in a higher degree take the back the control in their life. A lifeline they can reach when needed and at the same time invisible to their surroundings.

“ I didn't use my personal alarm, when my former boyfriend held a gun to my head because it makes a sound when I activate it. I was afraid he would kill me if he discovered me.

- Victim of stalking

ACKNOWLEDGMENTS

A special thanks to our supervisors Nis Ovesen and Erik Appel Jensen for providing knowledge, guidance and feedback through our project.

Additionally we also want to thank the many experts and respondents who provided us with insight, advice and feedback through our project. These include following people:

- Lars Nielsen, Telesikring
- Henrik Leth Egsgaard CEO at Den Jyske Kontrol Central
- Egon Slot Criminal assistant IT/ Communication Department at Aalborg police station
- Birgit Larsen caseworker at Aalborg Police Station
- Mette Frost Counsellor at Randers Krisecenter
- Kristina Mark Counsellor at Mødre hjælpen Aalborg
- Martin Kibsgaard Jørgensen from the department of Architecture and media technology at Aalborg University
- Interviewed victims and relatives
- Igor A. Strytsin, Ph. D. -student, Institute for Electronic Systems - Antennas, propagation and radio networking



READING GUIDE

This project is communicated through a Process report, Product report and a USB-plug.

This report is divided into six different phases; understanding, define, concept development, detailing, implement and lastly the summary phase. Each capture consists of tasks which is divided into objective, explanation of the task (process and data) and conclusion.

Throughout the report two indicators are presented:

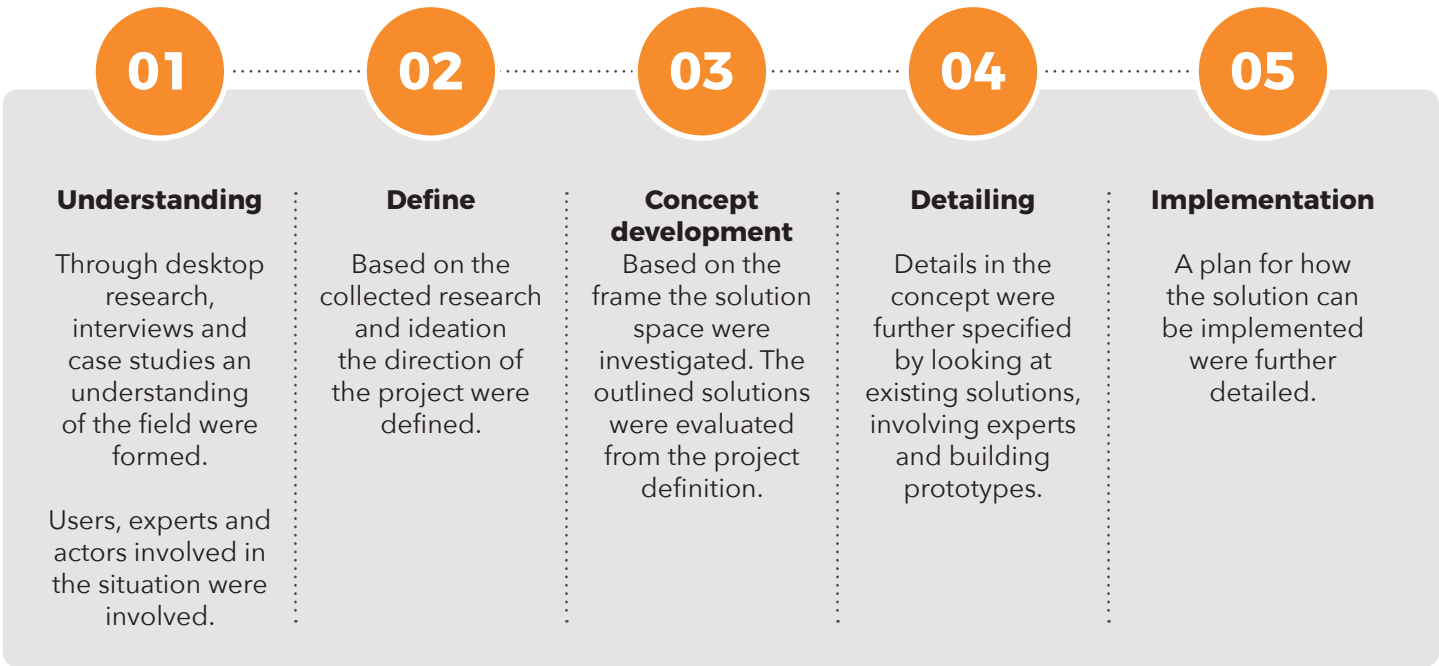
!

**Finding no. #:** The task lead to a finding which influence the solution.

↑

**Updated criteria:** The task lead to a updated criteria.

PROJECT OVERVIEW



ill. 1: Final concept

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# 01

## UNDERSTANDING

This phase shows the initiating research into finding the project focus within the project theme and will contain the performed research and the identified problems which will create the base for the project.

## CASE STUDY

Related worksheets: 2

### Objective

The project direction is based on a examination of personal experience with being exposed to treats and incidents of harassments and the use of a personal alarm within this context.

### The case

A family of four (Two parents and two daughters) was in 2010 subjects of ongoing harassment for about a year by a suspected known source. Through the case the family was exposed to following scenarios:

- Death threats over the phone
- Three men with covered faces showed up at the family's home at night demanding the family to open the door.
- Coming home to their house burning. The police discovered that external sources had broken into the home to start fire.

Within the time-frame of the case the family was dealing with extreme fear and a constant feeling of being watched and monitored by external forces. To feel more safe in their daily life they performed following actions:

- Mounted alarms all over the house
- Mounted cameras if there was someone outside the house
- Moved around from family member to family member
- Slept with a knife under the pillow
- Slept together in one room (four people)
- They called and massaged each other to ensure that everybody were doing okay
- Called each other if they spotted danger in the surroundings
- Got a personal alarm (Lommy) from the police

### Conclusion

The personal alarm provided by the police didn't fit the users immediate needs. Therefore there is an opportunity in developing a new portable alarm, which is more useful for the users.



**Finding no 1.** There is a opportunity to optimise the victims opportunity to reach help in critical situations.



**Finding no 2.** Mistaken calls is waste of resources for the police, victim and people around the situation.

### OUTPUT

Based on the family's statements regarding their experience with personal alarms the first project direction was identified.

Under the development of the case the family got a personal alarm (Lommy) provided by the police to give an extra sense of security in their daily life. The family quickly noticed some issues regarding the use of the alarm:

#### 1 Mistaken calls

It was too easy to activate the alarm. Therefore the family made a lot of mistaken calls, which made them worried when carrying the alarm.

#### 2 Bad feedback

When the button on the alarm was pressed, it was hard to recognise if the alarm was calling because of the lack of feedback. On day the father called the emergency centre by mistake and the police showed up armed at their address.

#### 3 Hard to carry around

It was uncomfortable to carry in the pocket because of the size and in the bag there wasn't quick access to it.

#### 4 Who should have it?

The whole family had to share one alarm, so they always feared the alarm might be at the wrong place when needed.

#### 5 Good at providing guidance

The family spotted danger everywhere so they used the alarm to get guidance about how to handle the situation.

Based on these problem areas a project potential was identified and the team decided to investigate the area further.



ill. 2: Portable alarm: Lommy



# TYPES OF VIOLENCE

Related worksheets: 16

## Objective

To outline the different types of violence victims are exposed to based on performed expert interviews.

The data used in this paragraph is provided by Kristina Mark counsellor at mødre hjælpen and Mette Frost counsellor at Randers women's shelter and [socialstyrelsen.dk 2017]

## Physical violence

Physical abuse can be defined as an intentional act which cause injury or trauma to another person by using bodily contact. Examples of physical abuse could be:

- Gripping, shaking, hit with a flat hand, a fist or a object
- Kicking, pushing against furniture, walls, down stairs, ect.
- Choking or attacking with knives or a firearm

## Psychological abuse

Psychological abuse is a form of abuse that often are associated with a situation of power in-balance and use behaviours (gestures or writing) to undermine or cause emotional damage to another person. Psychological abuse can consist of :

- Direct threats
- Degrading and humiliating behaviour
- Control and isolation

## Sexual assault

Sexual abuse is unwanted sexual activity, where the perpetrators are using force, making treats or taking advantage of victims and where the victim don't give consent.

- Unpleasant sensual palpation
- Attempted forced intercourse
- Rape

## Material violence

Material damage of a persons belongings and home:

- Destroy a person's things on purpose
- Destroy a person's things to scare
- Tear clothes and pictures into pieces

## Financial violence

Financial abuse centres around robbing a person of the right of having the control of their own money. Examples of this could be:

- Taking a persons salary and pay them in measured allowance
- Forcing the person to go into debt

## Domestic Violence

Domestic Violence is a pattern of behaviour which involves violence or other types of abuse by one person against another in a domestic setting, such as marriage or cohabitation. There is four types of domestic abuse:

## Stalking

Stalking is a type of psychological abuse, that centres around a unwanted and repeating surveillance, persecution and harassment. Stalking often consist of:

- Repeated phone calls, messages, e-mail, letters and harassment on the internet
- Persecution and surveillance by a persons home and workplace. Furthermore also surveillance through electronic equipments such as GPS
- Spreading of rumours and false accusations
- Harassment a persons family, friends and colleagues
- Malicious damage of a persons belongings
- Assault and treats regarding assault

## Conclusion

Through the investigation 7 types of abuse was identified. It's different which of the types each victim are exposed to and often many of the different types assault can occur under one case.

## Refection

Because of the almost infinite number of assault types, the expert interviews helped as a key-factor in outlining the types which were relevant for the project and it gave a bigger understanding of what the victim go through.



**Finding no 3.** Victims can be exposed to different kind of violence. We need to understand the victim and the situation further.

# PROBLEM SCALE

Related worksheets: 32

## Objective

In order to give an overview of how big the problem and the market is, desktop research was preformed in order to find statistics on the area.

## Conclusion

The data showed that a large amount of people predominantly females are exposed to domestic violence or stalking by a ex-partner, boyfriend/girlfriend or cohabit. It also shows that 13.096 women applied for help at the Danish women's shelter but only 1.749 women out of them where able to get the extra security of the women's shelters.

Based on these numbers it was terminate there was a potential marked for a future solution within this area.

## Reflection

The numbers used in this investigation only show the known factors.



**Finding no 4.** People exposed to stalking and people leaving a relationship with domestic violence can be a potential market for a future solution.

## KEY NUMBERS

**33.000 women**

**13.000 males**

Exposed to domestic violence in Denmark

**13.096 women**

Applied to the Danish Women's shelters in 2015

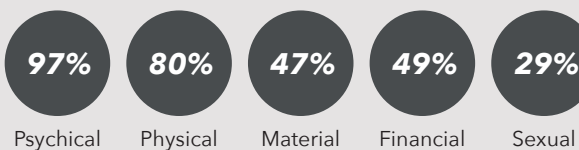
**1.748 women**

and 1.643 children in total received shelter at the Danish women's shelters in 2015

**10-12 women**

Danish women are killed every year by a partner or a former partner

## TYPES OF VIOLENCE INVOLVED IN A CASE



## THE TIME SPAN



[Social styrelsen, LOKK årsstatistik 2015]

## KEY NUMBERS ON STALKING

**100.000 - 132.000**

Danish people a year exposed to stalking

**17% of perpetrators gets a restraining order**

[danskstalkingcenter.dk 2016]



# THE VICTIM AND THEIR RELATIVES

Related worksheets: 6-10, 19

## Objective

In order to get a deeper understanding of who the victim and relatives are and how they feel, interviews of experts and relatives was performed. Additional desktop research and documentaries were watched.

## The victim

The victim is a person who have been exposed to stalking or have left a relationship with domestic abuse.

## Mentally destroyed by the perpetrator

This results in [Kristina Mark, Social Worker, Mødre Hjælpen]:

- They have a low degree of vigour, ability to focus, remember and getting overview
- They have a low degree of self-confidence and don't trust their own judgement
- They think it's their own fault when they are exposed to violence

## Stressed and low level of energy

Victims don't know when the next situation will happen. Therefore all their senses is constantly fully turned on to register all signals in their surroundings which could signify danger. To be prepared for the next episode they often use a lot of time to plan how to react in the possible situations which can be very energy consuming. They often feel the abuser have the control of their life. It's the abuser who decides when, where and how the next situation will happen [Kristina Mark, Social Worker, Mødre Hjælpen].

## Alone

They often are socially isolated and in some cases the family and friends don't know about the ongoing violence and harassment. This means that the victim doesn't have anyone to talk to about the situation. In other cases the family and/or friends do know about the situation but without fully understand what situation the victim is in and what they go through [Mette Frost, Social Worker, Randers Krisecenter].

## They feel

- Stressed, anxiety, paranoid, alone, controlled, guilty, don't trust them self, that no one can help or protect them, confused about what's normal, misunderstood, powerless.

**“The victims have a hard time focusing on information. I experience that I am repeating the same information when I guide them.**

- Kristina Mark, Social Worker at Mødrehjælpen

## The relative

It's very different which sort of relationship the victims have to their relative. Some are close and in light the family on the situation they are in while others are very isolated from their family which can be because of various of reasons. The relatives often have a hard time understanding the victim's situation and have difficulties in figuring out how to help the victim the best possible way. In some cases this lead to conflicts and in worst case they cuts the contact to the victim. Further they are afraid that something will happen to the victim [Mette Frost, Social Worker, Randers Krisecenter] and [Kristina Mark, Social Worker, Mødre Hjælpen].

## They feel

- Out of knowledge, sad, depressed, afraid, the situation is out of their hands.

## Conclusion

The victim is in a difficult situation both mentally and physically, and they are dealing with worries regarding the future and what might happen, they feel alone in their situation and can sometimes have isolated relationship to their social circle. Also because of their mental state it can be hard to get an overview of their possibilities.

## Reflection

It haven't been possible to get in directly contact with the user. But through interviews with experts, a relative and watching documentaries insights about the user was clear.

**“I feel excluded by the system and like no one is able to help or understand me. The stalking just continues over and over and will never stop.**

- Rikke Nielsen, Victim

**“I don't feel safe in my own home. I feel like he can see me everywhere**

- Janni Hoffmeister, Victim

**“I feel that someone else have the control of my life.**

- Rikke Nielsen, Victim

**“Your senses is fully turned on to register a danger. Further you are constantly planing what to do in possible situations in the future.**

- Henriette Birch Hansen, Relative

**! Finding no 5.** The victim needs to know that the help is near in case of assault (a clear plan).

**! Finding no 6.** The victim needs clear, and repeating information with a minimum amount of text.

**! Finding no 7.** The solution should make the victim able to take over the control of their situation.

**! Finding no 8.** The solution should make the victim feel less isolated.



ill. 3: Janni Hoffmeister victim of stalking



ill. 4: Relative

# THE PERPETRATOR

Related worksheets: 5-10, 20

## Objective

To investigate which traits often characterise a perpetrator in case where an abusive relationship evolves to stalking. The data will frame which reaction patterns that should be considered in a future solution.

The abusers are often described as normal people who doesn't seem to have a nature of violent behaviours, but have a problem with power and control against their partners. [Lokk.dk] Psychologist Lars Bjerregaard from the forensic psychiatry department at Risskov Hospital describes three types of motive structures; a narcissistic type, a sadistic type and a type that consider it self as being independent[Boriis,C. Michael, R. (2017). Når Kærlighed bliver til had. TV2].

## The narcissistic type

Use humiliation, violence, and torture as a mean of punishment. This can for example be if he/she feels overlooked by victim (his partner or ex-partner) or if the victim hasn't been attentive enough according to his needs, and use the punishment to pull her back into his control, so the victim continued is subject to his power.

## The sadistic type

Uses the humiliation, violence, and torture as a mean of punishment, but combine with forced sexual pleasure.

## The independent type

Considers themselves as independent, without the need of being in a relationship or the support it brings, but at the same time realize he indeed need those things, which doesn't match his self-view. He solves this by trying to transform the victim into something that strictly speaking, is nothing worth.

Even through the abusers in most cases can be placed within one of the three types motive structures, all three of them have some common

trades regardless of their category:

## Selfish

All of them are quite focused on their own needs, and see the victim as their private property.

## Controlling

They all use their abusive nature in an act of control, where they will do whatever it takes to control and re-establish the control over the victims and their surroundings. They are manipulative and know which strategies to use to maintain the control.

## Good at planning

They are often god at planning how to achieve the control over the victim, and they can be very patient regarding making it happen. They are strictly focused on the control they want to achieve which also means that they most cases never learn of their actions.

“Often the perpetrators seems as normal people to their surrounding, which often can make it difficult for the victim to convince others regarding what is happening

- Kristina Mark (Mødrehjælpen)

“They will often do almost everything to restore the control over the victim and in a abusive situation can the smallest things can worsen the situation and he/she can lose control. We often tell victims to turn of the GPS in their phone so the perpetrator cant track them.

- Mette Frost (Randers Women Shelter)

## Conclusion

The investigation shows that experts divide motive structures into 3 categories, which all have some common trades. All the abusers use obsessive control and is willing to do almost everything to maintain that control which both involves humiliation, violence, and torture and extreme manipulation.



**Finding no 9.** The solution should make the victim able to take control of the situation - without worsen it.

# SCENARIOS

Related worksheets: 5-10

## Objective

To describe scenarios of what can happen in a abusive situation between the victim and the perpetrator and which problems that are related to the situation.

The scenarios presented are based on incidents real events decried by victims of stalking. [Boriis,C. Michael, R. (2017). Når Kærlighed bliver til had. TV2].

## Conclusion

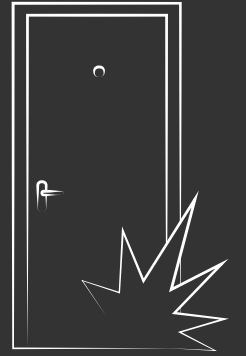
Victims doesn't have the opportunity to reach help quickly in a discreet manner in a critical emergency situation. The result of this is worries in their every day life reading what might happen and many cases about dying.



**Finding no 10.** New finding: Victims need the opportunity to reach quick without the perpetrator noticing in a critical emergency situation.

## 1 EXPLODED THE DOOR IN THE NIGHT

Janni Hoffmeisters ex-boyfriend tried to break into the room her and her daughter were sleeping in, by trying to bust the window with explosives.



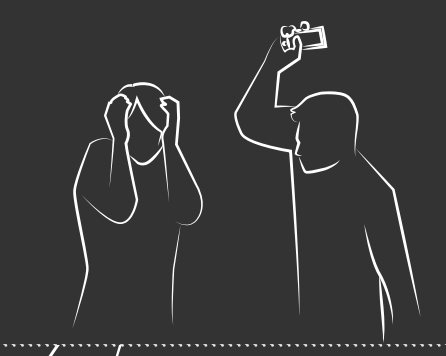
## 2 POINTED AT WITH A GUN

Christina Lolls ex-boyfriend threatened her with a gun when her children were around. She didn't use her personal alarm because it was too obvious and emitted a sound. She was afraid it was too obvious and he would kill her.



## 3 SHOW UP AT THE HOUSE

Sabine Staches ex-boyfriend abused her physically in her own apartment. She succeeded to call her dad from her phone. But then her ex-boyfriend destroyed her phone and pulled her down to the floor.



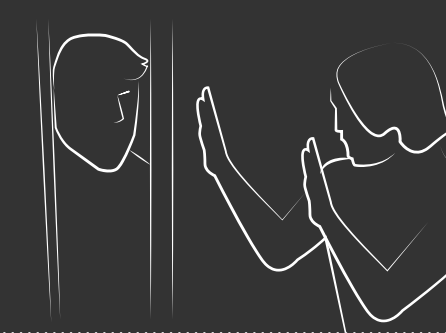
## 4 KIDNAPPED

Maria Midtgaard was violently forced into her ex-boyfriend's car where he drove around with her for many hours and threatened her on her life. In the situation, she could not call for help because her phone was out of reach and she was afraid he might notice if she reached out for it.



## 5 EX-BYFRIEND BREAKS IN

Gitte Abrahamsen was walking out of the door to her apartment, when her ex-boyfriend pushed her back into her apartment and assaulted her. She had checked outside many times before leaving the apartment.





# VICTIMS SITUATION OVER TIME

Related worksheets: 22, 10, 6

## Objective

Research showed the victims needs and situation changes over time. This investigation focus on providing an overview of the situations over time, and needs.

Ill. 6 shows how the situation often develops over time. It's based on information from Randers Women Shelter, Mødrehjælpen, and the documentaries ". The map is divided in to stages which is described bellow.

### Stage 1: Seduce and charming victim

The abuser is very kind, funny, sensitive and sweet person to the victim. He/she is creating the illusion that the victim is the dominant partner in the relation ship by idolizing him/her. He/she establish a magic atmosphere of trust and love. The abuser manipulates the victim to have empathy by telling stories about their poor life.

### Stage 2: Isolate the victim

The abuser isolates the victim from friends, family and colleges. Some by moving to an other town to make sure that the surroundings don't figure out about the coming violence. In other words he/she is establishing the fully control of the victim.

### Stage 3: Introduce threats (psychological violence)

The abuser begin to threaten the victim about being abused. He/she is pulling the victim mentally apart by telling victim how stupid she/he is, and is controlling what she is wearing, how he/she spent money and who she talks too.

### Stage 4: Repetitive violence

Repetitive violence is becoming a implemented part of the relationship. Both financial, physical, material and physically. Often the victim doesn't know that they are abused. Even though the abuser have put his/hers hands against the victims neck and pushed so hard the victim could barely breath. Because the victim is mentally destroyed, he/she believes that it's their fault they are abused. At other times the victim believes he/she can help the abuser to stop the violence.

The victims view of what's normal is a everyday being abused and threatened to death by the person they love. The victims senses is fully turned on to register what mood the abuser is in, and is constantly planing how to react in case of an assault. On this stage the victim doesn't know they are abused.

### Stage 5: Victim realize

When/if the victim realize that they are exposed to violence, they don't know how and is afraid to break out of the relationship. They are afraid of what the perpetrator will do to them, and if they are able to take care of them self.

The victim feels that they are alone and unique in their situation. Further their surroundings don't understand why the victim stays, and how to help them. To get out of the relation the victim needs to break the silence and their surroundings to provide a safe way out.

### Stage 6: Long term stalking

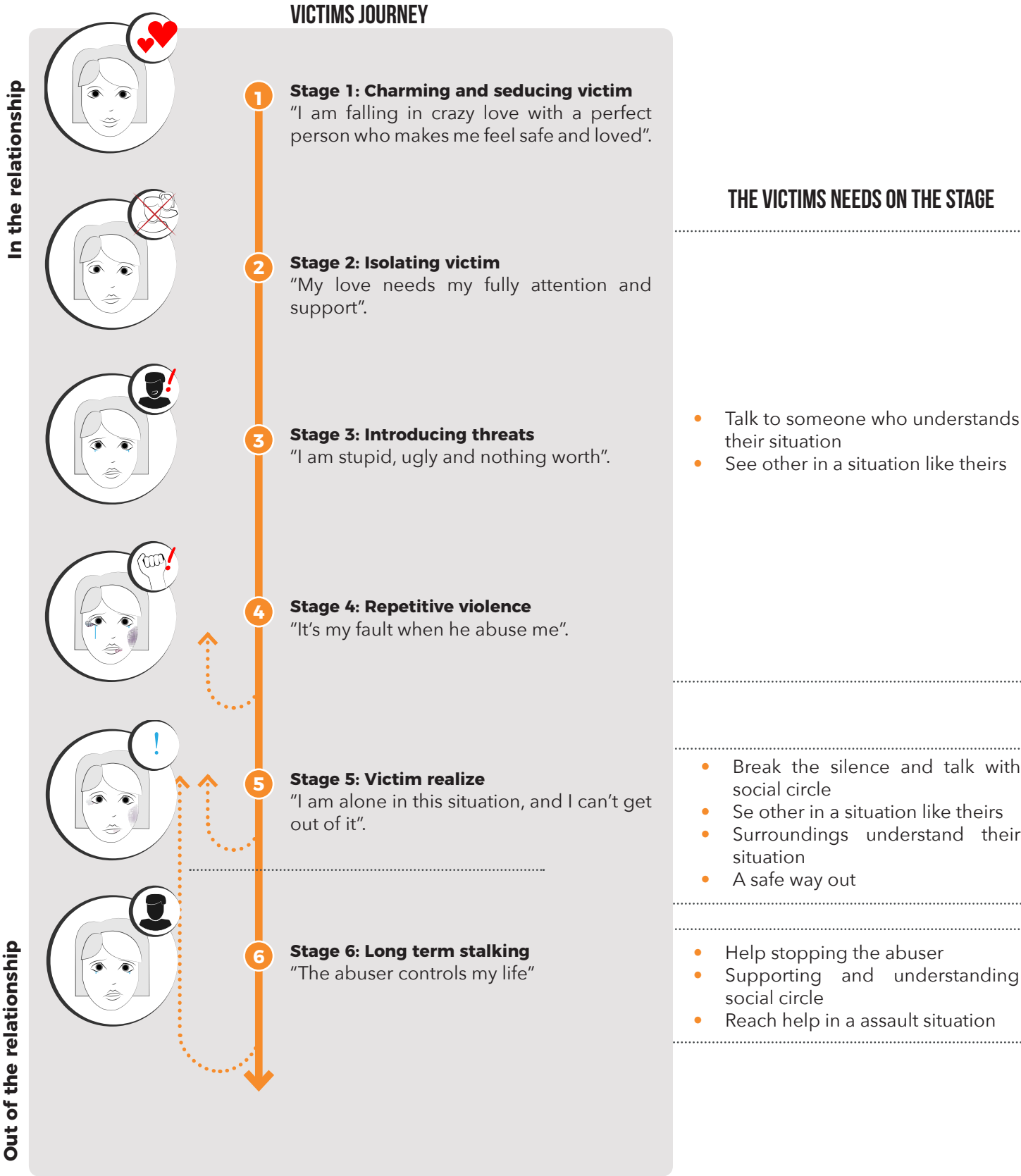
After ending a relation to the abuser, the situation often turns in to long term stalking. The abuser is trying to re-establish the control of the victim. This often continues for many years. Also even when the abuser is in a new relationship. It's hard to prof their case which also means that the police can't really help them. Even if the perpetrator have to pay for his/her acts, the situation often just stats over again and again. Therefore the victim feels that no one can help them, that they are alone and is constantly worried about what happens next.

### Conclusion

To make a safe way out of the relation, the victims need to break the silence and talk to their social circle about it. Further they need their relatives to understand their situation and provide a safe way out. There is two types of victims: those who have realized their situation and them who haven't.

**Finding no 12.** The victim needs to see other in a situation like theirs to realise they aren't alone.

**Finding no 11.** The victim needs a safe way out of the relationship.



ill. 6: Stages

# TYPES OF SITUATIONS

Related worksheets: 6-10, 13-15, 17

## Objective

Research showed victims being exposed to violence or stalked have four types of situations where the victim needs help. These are outlined according to how they are capable of react, guided to react and what the perpetrator will do.

Through the cases that have been investigated until now, it showed there is a link between the situations the victims is going through. Further the victims don't know what their next situation will be and when. Not all victims have or will experience all situations, but they don't know for sure if they ever will. This investigation is based on information from Kristina Mark (Social Worker at Mødrehjælpen), Mette Frost (Social Worker at Randers Krisecenter) Birgit Larsen (Case Worker at Aalborg Police) and the Danish documentary "Når kærlighed bliver til vold", at TV2.

## Conclusion

The investigation showed four types of situations the victims experience. The victims have challenges according to reach the kind of help and support they need depending on the situation. They will never know when and what will happen next.

## Situation



### 1 Emergency situation

The victim is in direct contact with the perpetrator and have a short time to react. The situation often includes physical, psychological, material, and/or sexual assault. An incident of this type can happen at home, in public or when they are together with family and friends.



ill. 7: Physical violence



## Capable of react

- Almost no time to react.
- Some freeze physically
- Some fight back
- In some cases, the victim does not call for help because their phone is out of reach or because they are afraid that the perpetrator notice their actions.



## Guided to react

- Not worsen the situation
- Quick and discreet call for help and give location and provide information regarding their situation
- Seek safety
- Report it to the police
- Accept that you are afraid



## Perpetrator

- Makes sure that the victim isn't able to seek or call for help (Locking doors, take away the victims phone and/or other device which makes them able to call for help)



### 2 Imprisoned

The victim are imprisoned either by the perpetrator or because they seek safety from the perpetrator. In this situation they often have time to make decisions and plan how to get away. Further they have time to call for help if they have the possibility. But it requires the perpetrator haven't taken their phone or other possibilities to reach help.



ill. 8: Imprisoned

- Often they have time to plan how to escape and/or call for help without the perpetrator finding out
- In some cases they just wait till the situation has subsided and then they get away

- Not worsen the situation
- Quick and discreet call for help and give location and give information regarding their situation
- Seek for own safety
- Report it to the police

- Makes sure that the victim isn't able to seek or call for help (Locking doors, take away the victims phone and/or other device which makes them able to call for help)



### 3 Assault from afar

Here the perpetrator exposes the victim to threats from a afar. This can be by threats on email, message, phone calls or material damage on the victims private possessions. Further more this situation could also be that the victims spots the perpetrator from a window or on the street.



ill. 9: Assault from afar

- The victim have time to call for help, be guided or find out how to react.
- Depending on where the perpetrator is some is able to speak

- Report it to the police
- Collect technical evidence
- Show the perpetrator that you call for help
- If you don't know what to do, then call for help

- Often doesn't care if the victim have evidence
- Knows how to cheat the system
- Trying to re-establish the control of the victim by threats



**Finding no 13.** The victim never knows which situation will happen. The victims needs changes depending on the situation.



**Finding no 14.** The solution should not be recognizable for the perpetrator.

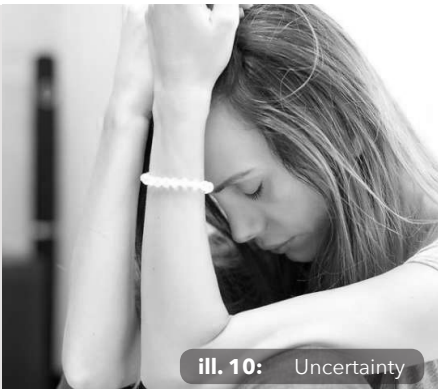


**Finding no 15.** The solution should consider these four situations.



### 4 Moment of uncertainty

This is the time between the assault episode where the victim deals with worries and needs guidance on how to deal with the situation. In this time period the victim is left to his/hers own thought and have more time seek help or find information regarding the situation.



ill. 10: Uncertainty

- Have a hard time read and remember information
- Call for guidance
- Go to guiding conversations with professionals
- Many don't have friends or family to talk with

- Plan how to act in future situations
- Talk about your situation
- See and talk to other in a situation like yours

- Plans the next episode



# INVOLVED ACTORS

Related worksheets: 4, 6-10,11, 13-15,18,21

**Objective**  
Map the important actors who are involved to help and guidance to victims of stalking.

This investigation is based on interviews with Birgit Larsen (caseworker), Kristina Mark (Social worker (Mødrehjælpen), Mette Frost (Socialworker, Randers Krisecenter).

**Hard to provide overview**  
A big number of actors are involved in the cases of violence. These provide different kind of help to the victim. The victim needs to find and contact these by them self. As there is many actors, it's hard to get the overview and figure out what provides they have and who to contact. Often they are sent from actor to actor which is confusing to the victim. It could be from the reporting the case to the Police to collect technical evidence at the hospital or having personal guidance at Helping Organizations. All depending in what the victim needs to do.

**Victim are dependent on actors**  
The Women Shelters and helping organizations have a limited capacity to help the victims. The victims are dependent them and their time. There is a risk that the actors doesn't have time when the victims need it.

**Conclusion**  
Today it's hard for the victim to get the overview of what opportunities they have and where to go. Further the actors doesn't necessarily have time when the victims need it.

*I always guide the victim to do all they can't to worsen the situation, seek for their own safety, call for help and report their case to the Police. If the perpetrator finds out the victim called for help there is a risk it will worsen the situation.*

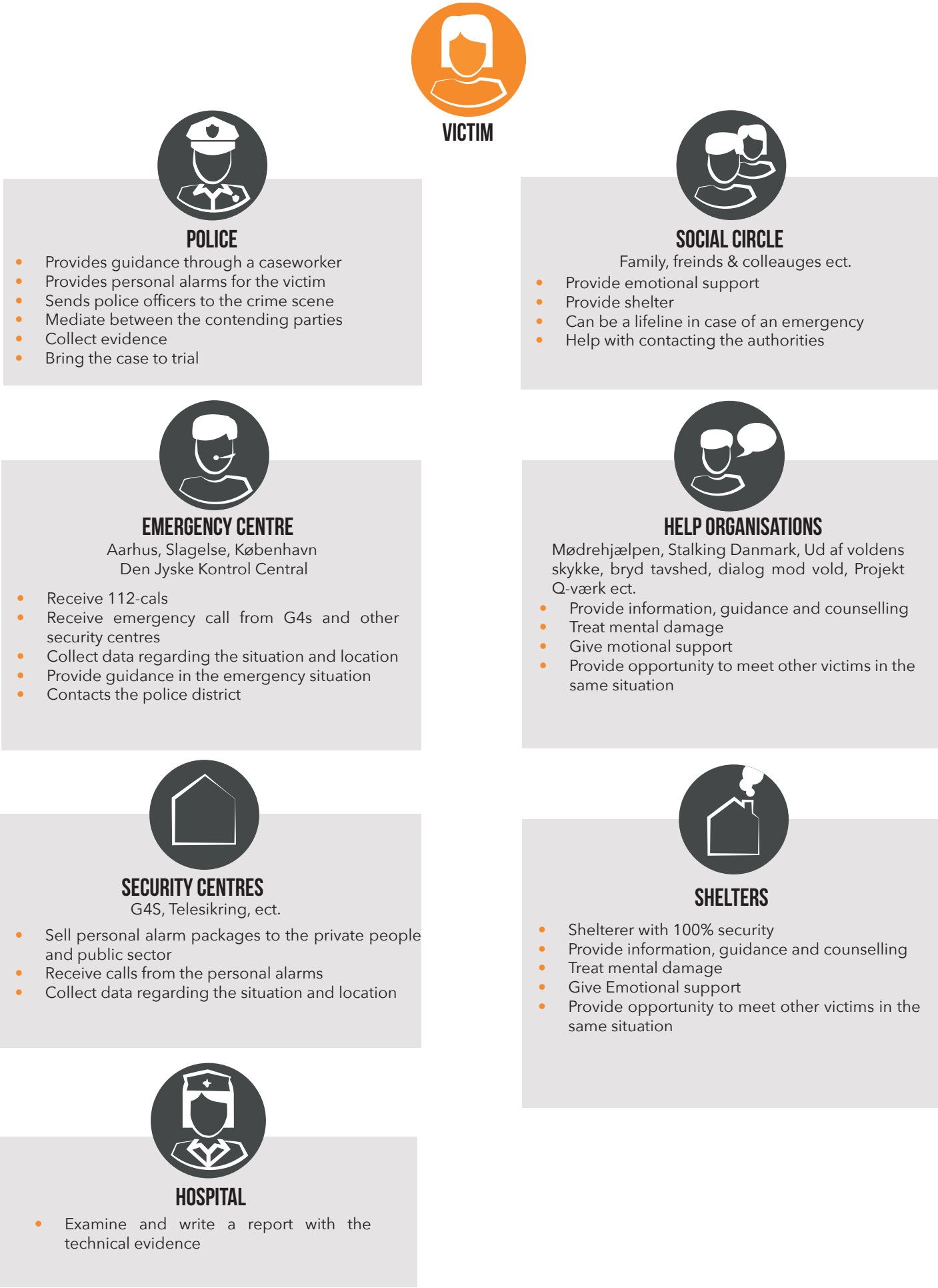
- Kristna Mark (Social Worker Mødrehælpen)

*The police can't promise personal protection in Denmark (...) It's only the Women Shelters who can promise 100% protection.*

- Birgit Larsen (Case Worker at the Police)

**Finding no 17.** The solution should provide an overview of the victims opportunities.

**Finding no 16.** The solution should make the victim independent on organizations time.



# PROCESS A CASE

Related worksheets: 10, 40

## Objective

To create an overview of stalking cases and domestic violence are processed in a legal sense both when it comes to the police investigation and the Danish legislation.

This study is based on information provided by Caseworker Birgit Larsen from the Department of Honour Related Crime at Aalborg Police Station, together with knowledge provide from LOKK's annual rapport on stalking and domestic violence.

## Introduction

The Danish police often experience difficulties solving the cases. On of the main reason for these difficulties ill defined Danish legislations with in the area the other main reason is the difficulties in providing adequate evidence.

## Collecting the evidence

As mentioned earlier an other reason for the lack in persecution of the offender is because the victim can have troubles with collecting adequate evidence. The women's shelters advice the women to keep a journal over the different incidents. How the victim can collect evidence

- Note and store all evidence. Make a list of dates and times for all inquiries: Text messages, calls e.g.
- Get friends, family, and others to help to gather evidence.
- Note any physical inquiries even if there is no tangible evidence for them. Notes any witnesses.
- Find out if your mobile phone has a recording function (The most recent models) and then record any calls and threats on the phone.
- Take pictures of footprints or any another evidence, showing that the stalker has been present.

## Endless cycle

1 of 3 case the stalker continues the stalking after a conviction and in some cases they even stalk from prison. Because of the soft sentences in the Danish criminal justices many cases move in cycles where the victim collect evidence, the offender gets a restraining order and where the stalking continue. Then the victim have to collect new evidence to prove the offender is braking his restraining order, and a case can carry one like this for many years.

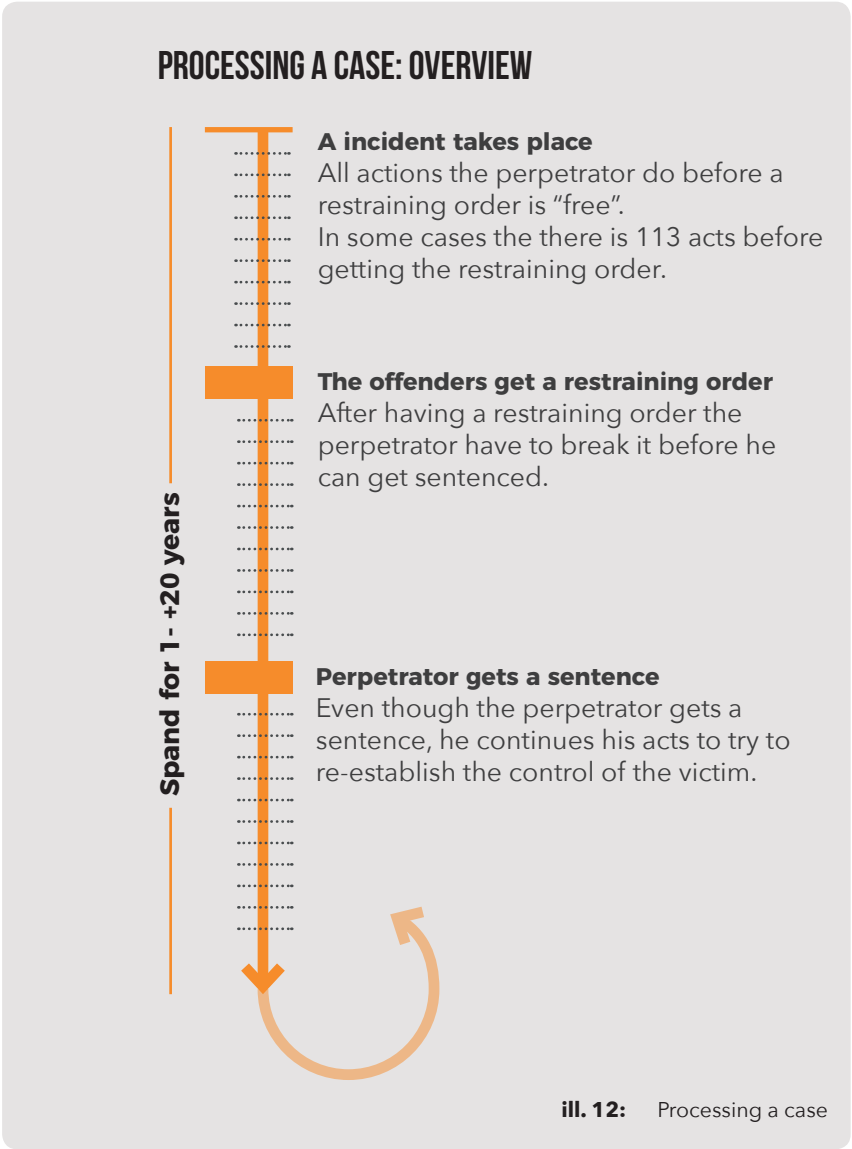
## Conclusion

The investigation showed it can be very difficult for the police to take legal action against the offenders. The victim have to present evidence consisting of a various of factors that can be difficult to collect and organic. Even in cases where the offender gets convicted the stalking continues.

- !

**Finding no 19.** It's difficult for the victims to get collect the needed evidence.
- !

**Finding no 18.** The stalking often continues after conviction and can carry on for up to +20 years.



- Violence actions by the perpetrator**
- Material violence
  - Stalking
  - Physical violence
  - Physiological violence
  - Financial violence
  - Domestic violence

ill. 12: Processing a case





## SPECIFICATION

**Measurements:** 90 x 61 x 23 mm

**Material:** ABS

**Technology:** PBS and GSM

## FUNCTIONS

- **Two way radio** so the emergency central and the victim can communicate
- **G-sensor** with adjustable trigger function
- **MP3 player** for playing alarm messages
- **Vibrator and audio** as response from the Emergency centre
- **Red Alarm bottom** for making the calls
- **Status indicator** Red, yellow and green light indication

# THE LOMMY ALARM

Related worksheets: 11,21,28

## Objective

To analyse the most dominant personal alarm on the Danish market and by looking at it's use, the technology and system and compare it to the needs found trough the investigation.

The information used in this section are mainly based on data provided by expert interviews with Egon Slot Criminal Assistant in the IT/Telecommunications department Aalborg Police Station, Henrik Leth Egsgaard Director at Den Jyske Kontrol Central and Lars Nilsen Chief Fitter at Telesikring Aalborg and [Care4all.com].

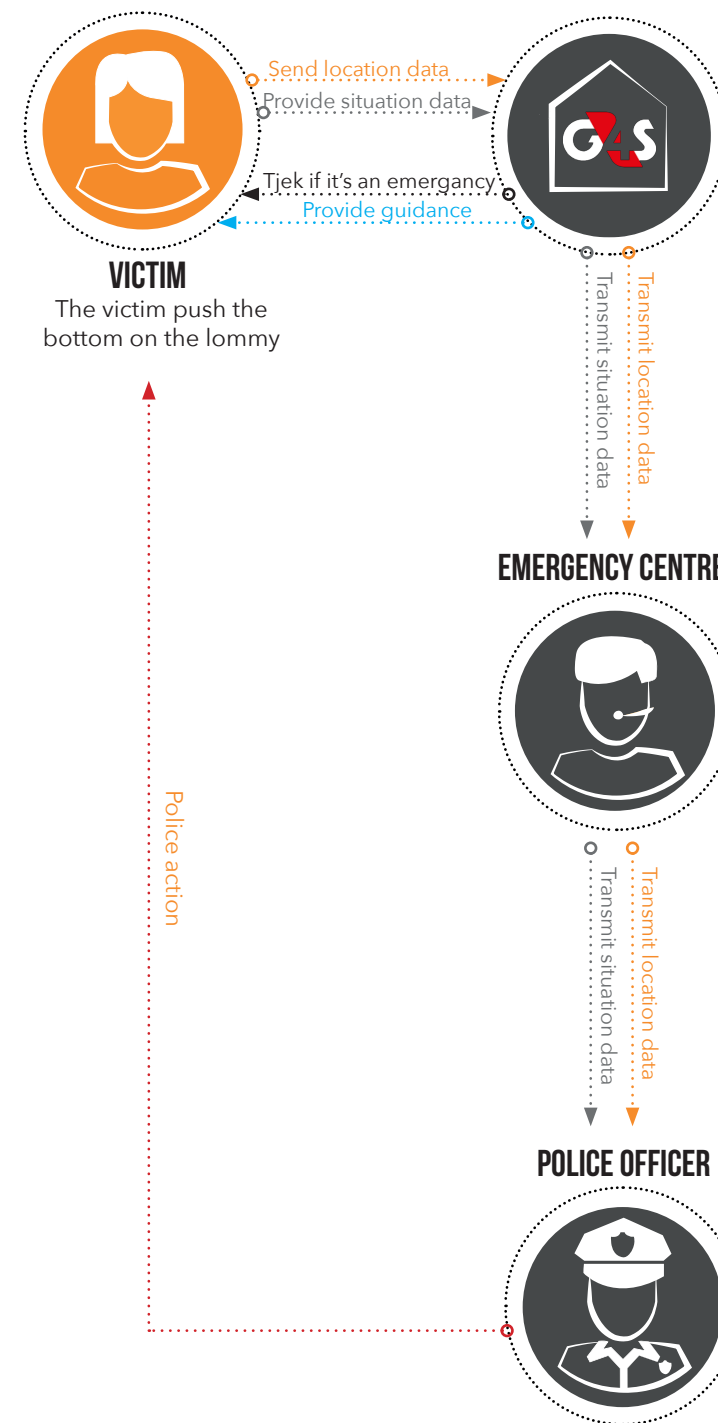
## The Lommy

The tracker is the most dominant personal alarm on the Danish market and it's the solution the Danish police provide to victims of stalking abuse. The alarm is a portable GPS from Care4all. The alarm are purchased and resold as package solutions by Danish security companies such as G4s and Telesikring. G4S are the supplier of personal alarms to the Danish Police. Each police district pay 6.000 DKK. for each alarm and a additional monthly fee as Egon Slot described as soaring. G4s also have a package for privet purchase with a monthly fee on 375 DKK/month.

## How it works

1. The victim presses the red bottom.
2. Alarm makes a sound to inform the victim that it's connecting to G4S.
3. G4S receive the call from the Lommy alarm along with data on the location of the alarm/victim and pre-defined data regarding the victims situation.
4. The employee at the emergency company listens for 5 seconds to the radio connection to judge the situation.
5. The employee guidance the victim.
6. The employee at G4s then call one of the Danish Emergency Centres and pass on the data collected regrading the location and the situation.
7. The Emergency centre contacts the closest police patrol and give them the data
8. The police act on the call and drive to the location.

## Lommy System Map



## New observed problems



The sound from the Lommy can attract unwanted attention from the perpetrator.

The Lommy is too recognisable, in some assault cases the situation can become worse if the perpetrator recognizes that the victim is trying to reach help.

The victim can have problems reaching help because the tracking system doesn't work well indoors.

It can be difficult to push the bottom on a emergency situation if the alarm is in the pocket or placed away from the victim.



Most of the emergency calls the security companies receive from the alarm are mistaken calls and it can be difficult to distinguish between which are real and which aren't.

Sometimes they can have problems receiving the location from the GPS because the device has a problem connecting to the satellites.



The police use time on acting on mistaken calls.

“It's completely insane that the alarm works like this. It goes without saying, it's outright useless, when a woman doesn't dare to use it because it makes a sound. In Christina Lølls cases, the alarm is completely hopeless.”

- Board director of LOKK, Birgit Søderberg

“I called the central accidentally several times. When I bring it, I think a lot about how to store it, without calling the central accidentally. I was afraid to every time. Every time it happened they ask me 100 times: 'are you sure that it was an accident?'”

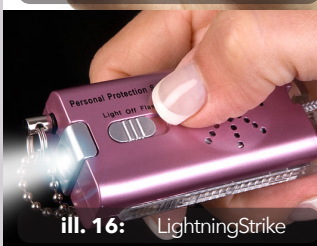
- Previous user of the Lommy, Britta Vestergaard



ill. 14: Plus



ill. 15: Lommy



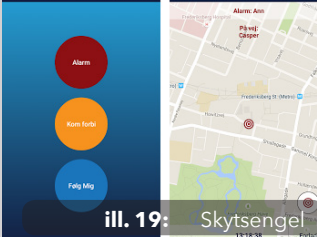
ill. 16: LightningStrike



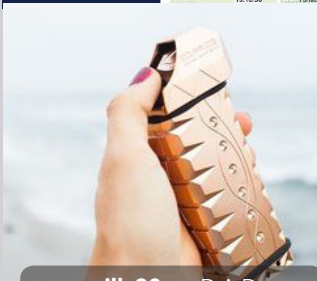
ill. 17: Doberman



ill. 18: BSFAE



ill. 19: Skysengel



ill. 20: D.A.D.



ill. 21: WISO

### 1. Call alarm with GPS

- + To way communication
- + Victim can receive guidance from the emergency, or other choose contacts
- + Send GPS coordinates
- Very recognisable
- Bad signal
- Difficulties in updating location
- Don't give information on which floor the victim are at
- To easy to preform mistaken calls
- High Price

### 2. Scare alarms

- + Low price
- + Small and easy to transport
- + Have the possibility to scare of the perpetrator
- The victim don't have the possibility to call the emergency centre or other stakeholders
- Don't provide any form of spot guidance
- Can't give the victims location
- Can worsen the assault situation

### 3. Tracing Application

- + The victim is a apart of a community
- + The victims can notify the other of their contact with the same APP in case of assault or fear of
- + Low price
- Perpetrators often take or damage the victims phone before or under a assault situation
- Very recognisable
- Many actions
- The victim are advised to disconnect tracking on their phone

### 4. Hybrid Alarm

- + Send notification to a choose network of contacts
- + The contact network can trace the victim on an APP
- + Can scare the perpetrator with sound or marking spray
- Don't provide on spot guidance
- Very recognisable
- Can worsen the situation

## ALARM ON THE MARKET

Related worksheets: 38

### Objective

To identify different personal alarms on the market today and investigate if there is a potential marked gap.

The investigation was based on desktop research and it identified four types of alarms which this paragraph describes.

**1. Call alarm with a GPS tracing:** Mainly used to call the emergency companies. In some cases it can also be used to call other stakeholders like family and friends. It has a SIM-card and a GPS, and are also widely used in the public sector and by transport companies.

**2. Scare alarms:** Used to scare a potential perpetrators by emitting a loud noise or distracting light. It's made for people with a fear of being robbed or attacked when they walk between locations.

**3. Tracking Applications:** A tracking application for the phone that victims can share with people from their social circle. Though the application they can notify and track each other in case of assault. These are target people who are afraid of being exposed to assault.

**4. Hybrid Alarms:** Consist of collective elements from the three other categories of personal alarms. The hybrid alarm is a mobile alarm device that can send a notification to people in the persons social circle which then tracks the victims location on a application on the phone. The victim activate the notification by performing an act on the device that can scare the perpetrator. In this two examples by making a loud whistle noise or creating a coloured marking on the perpetrator.

### Conclusion

Non of the investigated alarms meet the immediate needs of the victims. They are too unhandy, obvious which can effect the victims use of them. The applications makes it possible for the perpetrator to tack the victim therefore it's useless.

**Finding no 20.** The solution should make it possible for the victim to reach help in an emergency situation without worsening the situation and being exposed calling.

## SCENARIO TODAY

### Objective

To outline the discovered problems and turn them into needs.

### PROBLEMS

#### Missing overview

It's hard for the victim to get an overview of their rights, opportunities and what actors they can contact.

#### Victims feel alone

Victims often feel alone in their situation and have no one to talk to. If the victim have contact to their social circle, they doesn't understand them.

#### Spots danger every were

The victim spots danger every were in their surroundings.

#### Difficult to educate and prepare them self

The victims have difficulties in focusing on information and remember it.

#### Can't reach help in critical situations

Victims doesn't have the opportunity to reach help in a critical emergency situation without the perpetrator spots it.

#### Feel excluded by the system

The victim spends time on reporting their case to the police and collecting evidence with out result. This leads to that some stops to report it.

#### Time waste on mistaking calls

Most calls made by personal alarms today is mistaken calls. This is waist of resources for the emergency centre and the police.

### Conclusion

It's needed to explore the solution space to prioritise these needs and create the scope of the project.

### NEEDS



#### 1 Need overview

Victims needs overview of their contact persons, opportunities and information about their situation.



#### 2 Experience other in a similar situation

See and/or talk to people who understand and/or have been in a similar situation and experience that they aren't alone.



#### 3 Need help to educate their social circle

Regarding the victims situation and how to support provide a safe way out.



#### 4 Need on the spot support or/and guidance

When being abused from afar.



#### 5 Revise information by them self

About their situation and how to handle it.



#### 6 Quick and discreet reach help in a critical situation

Contacting the emergency centre and/or people in their social circle without the perpetrator noticing.



#### 7 Collect and store technical evidence

Victim needs to spent less energy and time on collecting technical prof.



#### 8 Minimised risk of mistaken emergency calls

Victims shouldn't worry about making mistaken emergency calls. The emergency centre and police should spent less resources on mistaken emergency calls.



## 02

## DEFINE

Based on the collected insight the frame of the project was defined with requirements and experience for the future product.

## PROJECT SCOOP

**Objective**

To decrease the project area according what user to target and what situation to create a solution for.

**Problem statement**

In Denmark about 100.000 people are exposed to stalking and 36.900 of these by an ex-partner or cohabit.

Their life is impact by repeated abuses, uncertainty about when the next episode will happen and how to handle it. Therefore victims feel they have lost the control of their life to the perpetrator.

In physical abuses situations the perpetrator will do everything in their power to remove the victims possibility to reach help. If the victim tries to reach help, and the perpetrator finds out, there is a risk that the situation will worsen. Therefore victims are afraid to call for help in the situation even though they have their phone in reach.

They are often socially isolated and think their situation is unique. Victims is mentally effected by their situation which results in a low surplus of mental resources and stress. Therefore they have a hard time focusing on a performing a task, and to get the overview of the helping offers.

Victims spent hours on collecting technical evidence for the Police. Stalking cases often ends without a judgement. If the perpetrator gets a judgment they often continue their actions without caring about the consequences. Therefore stalking cases often last for many years and results in victims feeling left alone and that no one is able to help them out.

“We can't shorten the timespan of stalking cases, but there was a potential to make victims re-establishing the control of their situation and provide the opportunity to reach help in emergency situations.

## SITUATIONS THE SOLUTION SHOULD HELP



1 Critical assault situation



2 Imprisoned



3 Assault from afar



4 Moment of uncertainty



# STAKEHOLDERS AND USERS

**Objective**  
To describe who the solution should target and stakeholder it should consider.



## TARGET AUDIENCE

### Primary: Victim

- Exposed to long term stalking
- Constantly in risk of being exposed to a assault situation
- Have left a abusive relationship
- Lack of sufficient mental resources (Problems focusing, remembering, lack of vigour)
- Socially isolated



### Secondary: Relatives

- Don't understand the victims situation
- Don't know how to support the victim

## STAKEHOLDERS



### Emergency centre

- Investigate the calls from victims and decides what kind of help the victims need
- Collect data about the cases for the police (location, involved people, situation)
- Link between the victim and police



### Police

- Have problems with proving the cases
- Spends time acting on mistaken calls



### Help organisations

- Province time-restricted information and guidance for the victims and try to prepare them for their everyday life

# DEFINING DIRECTION

Related worksheets: 36

**Objective**  
To ideate on a project direction based on the investigated needs and the described project framework.

The solution space for each of the eight identified needs was explored through sketching. Additionally, possible channels in which the solution could be provided through were listed and tried out:

- Website
- A new device
- Application
- Online chat
- Face to face
- Phone call
- Physical information material
- Social media

The ideation provided a range of different ideas on different platform. The ideas were evaluated based on the user situation and the which seemed most suitable for the various stages the victim go through.

### Feedback on the direction

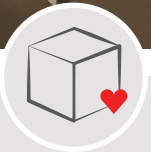
The direction were evaluated together with Mødrehjælpen and victims. They liked the idea of providing a collected package which enables victims to take more control of their life. They saw the most important thing as being the device because they doesn't have the opportunity to reach help in critical situations today. They believe the community where they can communicate with other victims and share their stories can make them feel less alone and understood. Lastly, they would like if they should spend less energy on collecting technical evidence and trying to create an overview over their possibilities

### Conclusion

The projects first priority should be the device which makes them able to reach help in critical situations discreetly. The second priority should be on helping them collecting evidence and provide an overview of the victims opportunities.



ill. 22: Exploring platforms



ill. 23: Evaluating platforms

### Service:

Application, face to face, phone call.



Provide information for relatives.



Make victims able to repeat information by them self.



A controlled community where victims can shear stories anonymous or not.



Provide an overview of victims contact persons.



Make victims able to collect and store technical evidence.

### A PACKAGE

### A new device:

A discreet wearable device.



Quick and discreet emergency call.



Provide on-spot guidance.



Produce technical evidence in the emergency situation.

Developed further  
Excluded through feedback



PRIORITY

**Objective**  
To define what is in-scope and what detailing degree it should be.



ill. 24: In scope and priority

**1st priority: Assault situations (device)**  
It's the primary focus to make victims able to reach help in assault situations critical assault situations and reach guidance (situation one, two and three). The new device will be conceptualized and designed according to interaction, functions, technical components, construction and aesthetics. This will be the main focus of this master theses.

**2nd priority: (service)**  
The secondary focus of the project will be to make victims able to collect and store technical evidence in a less energy consuming way then today. Further to create this controlled community where victims are able to share stories and experiences with each other. Functions of the service will be outlined and what media it should be provided through.

**Out of scope**  
To make victims able to repeat information by them self and for their relatives were defined as the less critical need through the evaluation. They already gets information with them home from the helping organizations. Therefore it wont be a part of this master theses.

NEEDS

**Objective**  
To prepare for going into the solution space needs was translated for the project insights.


	SITUATION	PRIORITY	NEEDS
DEVICE		1	 <b>Need on the spot support or/and guidance</b> When being abused from afar.
		1	 <b>Quick and discreet reach help in a critical situation</b> Contacting the emergency centre and/or people in their social circle without the perpetrator recognize.
		1	 <b>Minimised risk of mistaken emergency calls</b> Victims should not worry about making mistaken emergency calls. The emergency centres and Police should spent less resources on mistaken emergency calls.
SERVICE AND/OR DEVICE		2	 <b>Collect and store technical evidence</b> Victim needs to spent less energy and time on collecting technical prof.
SERVICE		2	 <b>Need overview</b> Victims need overview of their contact persons, opportunities and information about their situation.
		2	 <b>Experience other in a similar situation</b> See and/or talk to people who understand and/or have bin in a similar situation and experience that they aren't alone.

1 Critical assault situation 2 Imprisoned 3 Assault from afar 4 Moment of uncertainty


# NEW EXPERIENCE

**Objective**  
To align what the new experience should be and what it should feel like for the user.


ill. 25: A helping Hand



ill. 26: Powerfull



ill. 27: Undercover



**Having a lifeline**  
The victim haves a lifeline right by their fingertips, from which they can reach help when needed. Therefore they feel more safe in their everyday life.

**Feeling powerful**  
Victims should feel that they are powerful enough to take back the control of them selves and their situation.

**Undercover**  
The victim should feel their surroundings doesn't recognise they carry a lifeline. Thereby fade in to the surroundings and feel safe when carry and use it. But also make them feel less stigmatised.

# SOLUTION NAME

**Objective**  
To define the name for our solution.

The name shouldn't be recognizable the victims surroundings but at the same time the name should mean some thing to the victim.

The product name should radiate to the experience:

- Lifeline
- Powerful
- Undercover

The product name ended up being Invisa. It stands for "Invisible Safety".

The product name ended up being Inse. It stands for "Invisible Security".

CAFOME INCO CAWA CAME INVICA WATCHME SAFCO INCA CACO THE WATCH WATCHLINE INTY INSE INPO SACO MECA

invisa

# CRITERIA

**Objective**  
To align the team members and outline what the solution should fulfil for the victim, relatives, emergency central and police.

	NEED TO HAVE	NICE TO HAVE
DEVICE (1ST PRIORITY)	<p><b>Wearable:</b> attached to the body in case of an unpredictable assault situation</p> <p><b>Guidance:</b> Two way communication with a emergency centre or a contact person</p> <p><b>Discreet emergency call:</b> Call emergency centre or a contact person without the perpetrator hear or see the action</p> <p><b>Hidden interaction:</b> Preforming the emergency call without looking at the device</p> <p><b>Quick emergency call:</b> One action to perform the emergency call</p> <p><b>Minimise mistaken calls:</b> Insure the victim can't perform mistaken call</p> <p><b>Anonymous look:</b> should mimic other everyday wearable items, so the perpetrator can't recognise the device</p> <p><b>Clear feedback:</b> Should give the user clear feedback when interacting with the device(When calling, battery life)</p> <p><b>Battery life:</b> Min. 24 hours battery life</p> <p><b>Battery indication:</b> Clear indication of remaining battery power</p> <p><b>Tracking:</b> Should be able to track the users location both in- and outdoor</p>	<p><b>Programmable:</b> Allowing to program who the device should call</p> <p><b>Technical evidence:</b> should collect technical evidence in critical assault situation (images and/ or sound recording)</p>
SERVICE (2ND PRIORITY)	<p><b>Overview:</b> Over their contact persons, opportunities and information about their situation</p> <p><b>Mirror them self:</b> The victim see other in similar situations, to let them know that they aren't alone in their situation</p> <p><b>Motivation:</b> Minimum amount of actions</p> <p><b>Clear communication:</b> The solution provide simple and clear communication with low amount of descriptive text</p> <p><b>Technical evidence:</b> should collect technical evidence in Critical assault situation (Images and/ or sound recording, phone calls and messages)</p>	



# WEARABLE AND INTERACTION PRINCIPLES

Related worksheets: 19,46,49,51,52

## Objective

To explore the solution space for how the victim can wear and interact with the device.

Inspiration boards were formed with principles for how the solution could be wearable and activated. These principles were ideated on through sketching rounds where they were combined [W51].

The principles were combined into concepts. These were evaluated through act it out. The combinations which includes big unnatural motions or motions which were easy recognizable

for the perpetrator were excluded. This left us with three combinations with the most natural looking interaction.

## Conclusion

The activity resulted in three concepts for further development. Through the act-it-out three concepts were selected. These concepts the ones which through the acted out seemed to have quickest and most natural interaction. But before being able to choose which concept to develop further on, it was need to specify the concepts furthered and get some deeper insights to what makes the victims feel more safe in the situation.

### Interaction principles

- Motion pattern
- Button
- Speak
- Touch
- Connecting of two devices

### Wearing principles

- Arm
- Leg
- Ear
- Neck
- Chest
- Stomach
- Back
- Belt
- Foot
- Shoe
- Hand
- Finger

### Anonymous look

- Hidden
- Mimic

## Sketching based on principles

## Evaluation by acting the concepts out

# 03 CONCEPT DEVELOPMENT

Based on the project frame the concept development was initiated. Throughout the development experts and users were involved in testing and giving feedback on the concepts.

III. 28: Ideation on weable and interaction principles

III. 29: Ideationboard



# THREE CONCEPTS

Related worksheets: 52

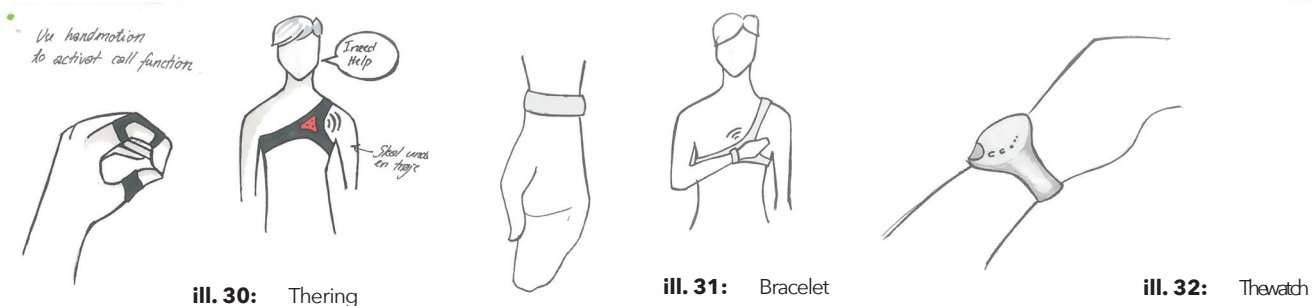
**Objective**  
To outline how the concepts solve the criteria, and what needs to be further developed.

Through act it out both pros and cons for the concepts were defined.

Below our believes about how the concepts fulfil the criteria.

- Questions for further development**
- How will victims feel about wearing the three concepts in their every day life?
  - What interaction will be the most natural and comfortable for them in a critical situation?
  - Which concept will make them feel most safe?
  - Which technologies can make the interactions work?

**Conclusion**  
Before getting feedback it's needed to specify the concepts further so the victims easier can relate them self to them and give more concrete feedback.



## CONCEPT: THE RING

The emergency call is activated by the ring which sends a signal to a base unit which placed on the chest.

**Wearable:** It could make the victim feel safe to wear it on the chest. It could be annoying to wear a ring all the time depending on the size of it.

**Guidance:** Tests showed the sound was able go through clothes. But there can be some problems if the victim wear a thick layer of clothes.

**Discreet emergency call:** The activation happens with a small motion with the fingers which is hard for the perpetrator to recognize.

**Quick emergency call:** It's one short action. The only limitation is if the victims fingers is locked.

## CONCEPT 2: BRACELET

The victim wear an armband and a base unit on the chest. The emergency call is activated by moving the arm up to the base unit.

**Wearable:** Many people is familiar with an armband which can make it comfortable. It can maybe feel safe to wear it on the chest.

**Guidance:** Same as concept 1.

**Discreet emergency call:** It's a relatively long but natural looking motion.

**Quick emergency call:** The motion can be fast, but only if the victims arm aren't locked.

## CONCEPT 3: THE WATCH

The concept is covered as a watch and activated by pressing a button.

**Wearable:** Many people are familiar with a watch. Therefore it might make them feel comfortable.

**Guidance:** The watch can be moved up to the mouth and ear while communicating through the device.

**Discreet emergency call:** Through act it out, it showed that the motion can be natural looking. But is require that the victim can control them self.

**Quick emergency call:** The motion can be fast, but only if the victims arm aren't locked.

# TECHNOLOGY AND FEEDBACK POSSIBILITIES

Related worksheets: 55,57

**Objective**  
To explore and evaluate what technologies and feedback possibilities can make the three concept interactions work.

Technology possibilities were evaluated by following criteria:

- Work with water
- Consistent performance

**Concept 1**  
For the ring concept a push button, the colour sensor and tension sensor were evaluated. It's hard to place the tension sensor on the finger in a way where it'sn't activated by accident. There is too much uncertainty about the colour sensor. The bush button is chosen because it's most consistence in performance, and it's possible to construct in a way which minimizes the risk of mistaken calls.

**Concept 2**  
The RFID is chosen for concept 2.

**Concept 3**  
For the ring concept the push buttons, capacitive and resistive were evaluated. The push button is the technology which is provides the most consistent preference.

**Conclusion**  
Through this investigation it became clear that the push buttons were the best solution for concept 1 and 3 and the NFC for concept 2. These provides the most consistent performance. It's still needed to work further with the integration of the technologies according to minimizing the risk of mistaking calls.

**Finding no 21.** Concept 1 and 3 uses push button. Concept 2 uses a combination of push button and RFID.

## TECHNOLOGY

- 1

**PUSH BUTTON**

  - + Consistent performance
  - + Natural feedback
  - + Works with water
  - + Can be made in small sizes
- 2

**RESISTIVE SENSOR (TOUCH)**

  - + Activated by pressure
  - Low sensibility and accuracy
- 3

**CAPACITIVE SENSORS (TOUCH)**

  - + Programmable outcome according to numbers of touch or glide
  - + High sensibility and accuracy
  - Doesn't work with gloves
  - Doesn't work with water
- 4

**TENSION SENSORS**

  - + Works with water
  - + Consistent performance
- 5

**COLOUR SENSOR**

  - Performance effected by light and water
- 6

**RFID**

  - + Consistent performance
  - + Works with water
  - + Tag unit can be flexible and small

ill. 33: Technology



# UNISEX PRODUCTS

Related worksheets: 49

**Objective**  
To outline which design parameters characterise unisex product by using Thomas Jagers form circle. The analysis is based on products advertised as unisex and the identified means should be implemented in the design of the new product solution.

Because the victims within this target group can consist of both men and women it's important to find an visual expression that can be used by both genders. To achieve this four products advertised as unisex was analysed

The analysis as seen on ill 34-37 showed design parameters used in unisex design is geometric driven shapes like squares and circle where corners and edges are softened with light curvatures. On some of the surfaces there also used convex curves to soften the product look. There also used organic curves and straight line mostly to highlight details. The use of the geometric shapes and soften edges creates a simple and calm product, with a functional expression where all unnecessary ornament or details have been removed.

- Conclusion**  
Unisex products have:
- Geometric driven shapes
  - Soften edges with light curves
  - Repetition of lines and shapes
  - Both convex and straight surfaces
  - Both organic and sharp edges to highlight details
  - Minimum use of unnecessary ornaments

There exists other types of unisex products than the ones that have been chosen in this analysis outcome may have been different if we had chosen some of the other products.



ill. 34: Libratone -Zipp



ill. 35: B&O Beoplay H7



ill. 36: Crosscover Black



ill. 37: Backpack

# IDENTITY

Related worksheets: 53

**Objective**  
To identify the new visual identity for the product which express the experience wanted to create for the user.

The three experiences were turned in to words which the aesthetic should express: safe, powerful and neutral/discreet. Existing products with this visual express were found.

**Conclusion**  
This activity resulted in two visual identities, which should be tried out on the solution.

ill. 38: Lifeline



Lifeline → Safe

ill. 39: Powerful

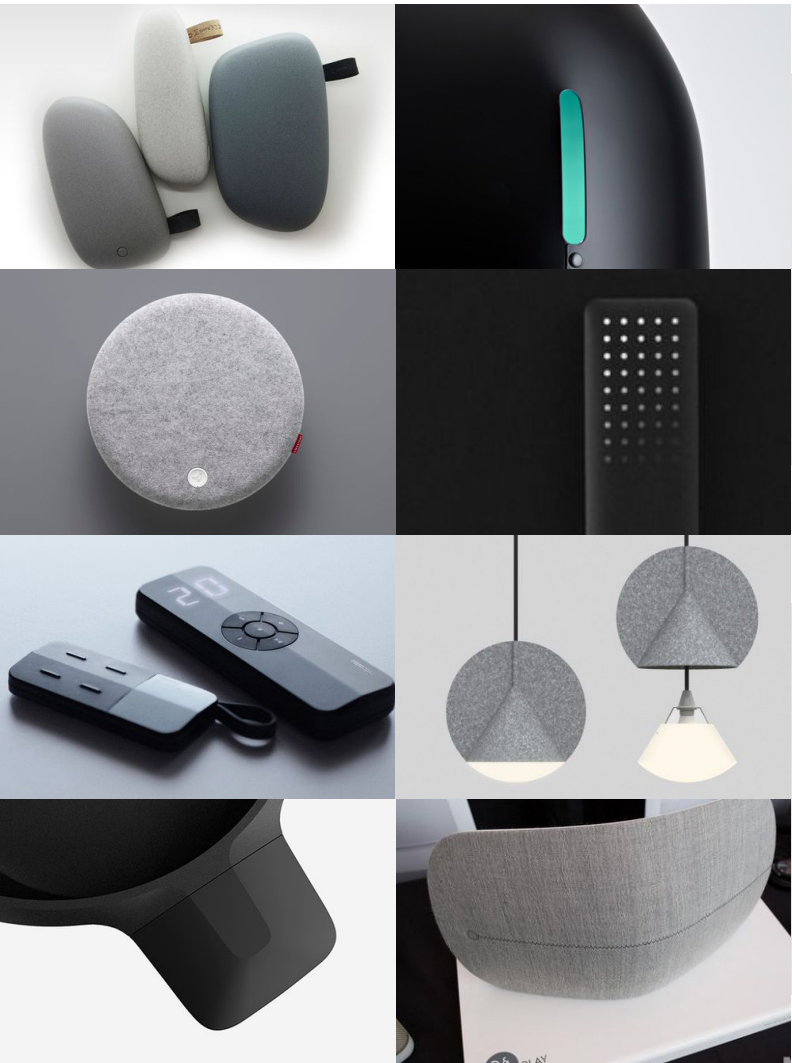


Powerful → Powerful

ill. 40: Undercover



Undercover → Neutral/discreet



ill. 41: Style board

**Direction 1: Soft shapes and colour contrast**

Safe: Soft curves and matte or soft surfaces.

Power: A contrast in colour

Neutral/discreet: Neutral colours

**Direction 2: Soft edges**

Safe: Soft curves and matte or soft surfaces.

Power: Soft edges

Neutral/discreet: Neutral colours



# SPECIFYING CONCEPTS

Related worksheets: 56,58,59,60,63

**Objective**  
To detail the three concepts according to minimizing the risk of mistaken calls, interaction, technology, feedback and identity.

The ideation was performed through sketching and act it out on each concept:

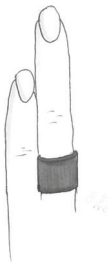
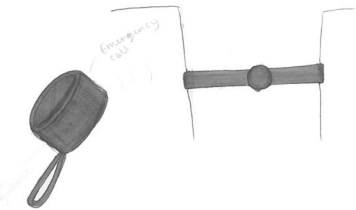
- How to perform an emergency call
- Minimize the risk of mistaken calls
- How to receive perform a guidance call
- How the user gets feedback while preforming the call
- Based on the style board the identity was explored

**Identity**  
The soft edges direction is chosen. Through sketching it was defined the most neutral lock is when the device is one colour.

**Feedback (calling):**  
A vibration when the user have started the emergency call but also to provide extra feedback to let the victim know the call is processing.

**Feedback (battery level):**  
LED light should indicate the battery level, placed hidden from the surroundings.

## CONCEPT 1



ill. 44: The ring - act it out 1

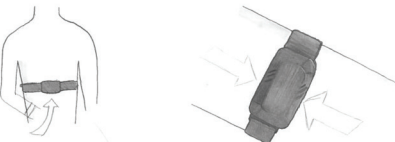
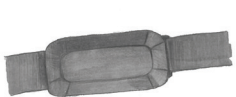
ill. 45: The ring - act it out 2

**Emergency call:**  
The push button is placed between the fingers and has a concave shape. Further the ring should be placed. It's important that the ring doesn't turn around. This makes them able to activate the emergency call with the same hand as they wear the ring on.

**On-spot guidance:**  
The victim can activate an emergency call by pushing two buttons at the same time. This means that they needs to use the other hand to activate the call.

ill. 43: The ring specified

## CONCEPT 2



ill. 46: Bracelet specified



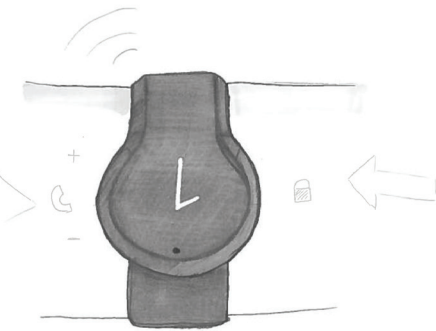
ill. 47: Bracelet - act it out 1

ill. 48: Bracelet - act it out 2

**Emergency call:**  
The emergency call is performed by connecting the bracelet and the base unit by pressing them together (RFID and Push sensor). This will minimize the risk of making mistaken calls.

**On-spot guidance:**  
After preforming the emergency call the victim can turn on sound by pushing two buttons at the same time on the bracelets.

## CONCEPT 3



ill. 49: The watch specified



ill. 50: The watch act it out 1

ill. 51: The watch act it out 2

**Emergency call:**  
The emergency call is activated by pushing two buttons at the same time (a lock and emergency call button). The lock button should minimize the risk of mistaken calls.

**On-spot guidance:**  
The victim can activate an emergency call by pushing two buttons at the same time. This means that they need to use the other hand to activate the call.

ill. 42: specifying concepts





# COLLECTING TECHNICAL EVIDENCE

## Objective

To explore different ways the victim can collect technical evidence to create a stronger case against the perpetrator.

Possible types of technical evidence which could be collected by the solution was explored. From different scenarios were examined and evaluated with previous victims. The scenarios were divided regarding two critical and less critical assault situations.

*I was thinking about collecting evidence all the time. But it should be quick if you should be able to do it in the situation.*

- Britta Vestergaard Jørgensen, previous victim of stalking.

## Conclusion

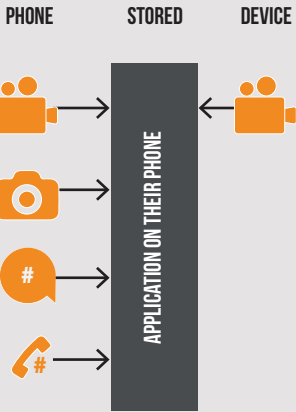
The solution should make victims able to collect and store technical evidence with their phone (scenario 2).

### Types of technical evidence

- Records no. of phone calls
- Records no. of text messages
- Record video
- Take pictures
- Sound recording

#### Scenario 1

When the victim makes emergency call the device produces video of the situation and store it on on the victims phone. The victim can produce evidence from less critical emergency situations with their phone. These are stored in a application.



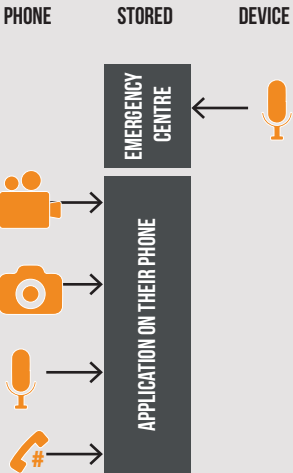
#### Evaluation

- It could make the victim feel more understood by the Police because they have a stronger base to build the case on.
- The victim have to consider and decide while be in the critical assault situation, if they want to document it the assault
- It will require more technology in the device and use more energy.

#### Scenario 2

When the victim calls the emergency centre, the sound is stored on their server (as today).

The victim can produce evidence from less critical emergency situations with their phone. These are stored in a application.



#### Evaluation

- Less technology components integrated in the device.
- Less energy consuming to collect technical evidence.
- It could make the victim feel more listens to by the police because they have a stronger base to build the case on.

#### Scenario 3

When the victim calls the emergency centre, the sound is stored on their server (as today).



#### Evaluation

- The victim should only worry if they need help in the situation.
- It won't be faster or less energy consuming to collect technical evidence for the victim.

ill. 52: Technical evidence

# THE CALLING SCENARIO

## Objective

To setup possibilities for the calling scenario: who should the device call in case of emergency?

An ideation of how the calling scenario could look according to who the device should call.

## Conclusion

Scenario 3 was chosen because the victim doesn't always want to involve the police. It can create stronger feeling of safety if there is two who know they needs help.

*My mom often calls her parents in case of emergency because she didn't want to involve the Police*

- Henriette Birch, Relative

*Many victims doesn't want to involve the Police*

- Kristina Mark, Social Worker at Mødrehjælpe

**New finding:**  
The victim should be able to choose who they call in case of emergency.

#### Scenario 1

Only calling the alarm centre.

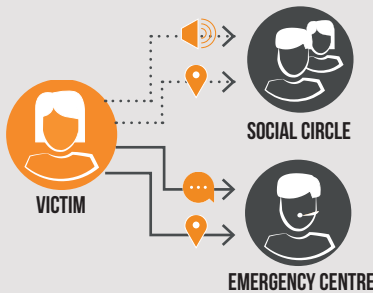


#### Evaluation

- The victim would not be able to choose if the police should be involved or not, which creates a risk that they would not call for help in the situation.
- The victim will not have to make the choice about who it should call. And they will not be wondering if it's calling the right person.

#### Scenario 2

Calling the emergency centre as a primary and send a sound and location to a secondary: a person they trust.

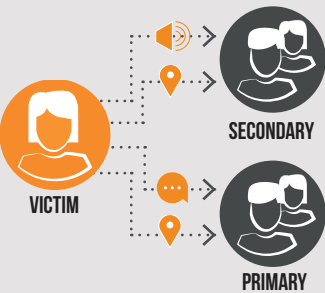


#### Evaluation

- If the victim calls both a person they trust and the emergency centre, they could feel more safe about knowing someone is on their way to help them.
- Not all the victims want to involve the police.
- The police will always be involved and provide the help they need.

#### Scenario 3

The victim is able to choose a primary person to call and a secondary to send a sound and location too.



#### Evaluation

- Some victims doesn't want to involve the police. But they still need the help if they are in the situation.
- It can create a feeling for the victim they have the control of the device/lifeline and the power to choose who they call.
- If they haven't set the alarm to call the police and they need it, they will not get the help they need.

ill. 53: Calling scenario

# REACTION PATTERN

Related worksheets: 70

## Objective

Creating a stronger base to evaluate the concepts on by investigating physical and mental reaction patterns in traumatic situations.

This investigation is based on a paper written by Peter Jurgensen "Hvad sker der i sind og krop under traumer" [kompleksptsd.dk, 2016]. This collect a lot of studies made by professors on how victims reacts in a critical assault situation.

It's important the victim is able to react help before they get to the 3rd and 4th stage.

## Conclusion

To provide the best ability to make emergency call the motion should be short, easy and not include co-ordination. Because of the limited ability to move and shaking muscles.

**Updated criteria:**  
Quick emergency call: One short motion which includes as less coordination as possible.

## DEFENCE REACTIONS STAGES



### 1 Freeze (stop and listen)

The victim freeze to prepare them self to react. It's like a brake where their senses is increased to register every detail in their surroundings.



- Increased hearing and vision to observe what happens
- Limited ability to move
- Decreased heartbeat
- Ability to remember



### 2 Immediate stress reaction (flight or fight)

The body is ready to react (fight to flight). Adrenaline is pumping and make the victim more capable to react quick.



- Increased heartbeat and breath
- Cold skin
- More sweat
- Sweaty hands
- Less feeling



### 3 Limited motion and awake

The body needs rest. It freezes and doesn't even react on painful stimulation. The victim is still able to think, their memory is intact. This means that their knowledge isn't affected on this stage.



- Extreme heartbeat
- Blurred vision
- Dizziness
- Prickly sensation
- Slow and difficult motions
- Memory intact
- Limited ability to talk or scream



### 4 No motion and not awake

The body slows down to protect it self for heart failure.



- Syncope
- Almost no ability to move
- No memory
- Sound and vision gets unreal
- No ability to talk

# TEST OF PROTOTYPES

Related worksheets: 63

## Objective

To evaluate the three concepts with users according to the interaction and how it's to wear.

## Test setup

Through a test the victims is asked to wear the three concepts in prototypes and act like they are using it. Through the test the victims will be asked about:

- How it's to wear
- How it's to interact
- If they see them self wear the solution on a every day basis
- Positive and negative aspects

The involved were Britta and Niels Jørgensen (previous victims), Henriette Birch (relative who have been in a similar situation) and social worker Kristina Mark from Mødrehjælpen.

## Conclusion

The answers which overlapped was:

- They liked the ring in concept two because of the small motion which you could activate also if your arms are fixed
- That concept 3 look familiar

It's important that the solution doesn't look stigmatizing so it reminds the victim that they are a victim. The solution should be able to take of and wear in a different way in periods where they doesn't feel unsafe.

## Reflection

Now that some of the victims were a group members relatives, we were critic about the answers and made sure for them that they should be critical to the solutions. To verify the information from them, another relative and a expert were involved.



**Finding no 22.** Adapt to the victims state of mind: In critical periods the victim should be able to wear it in the most effective manner. But replace it into a more hidden placement in periods where they doesn't feel like a victim.



**Updated criteria:**  
Anonymous look: should mimic other everyday wearable items, so the perpetrator can't recognise the device and it'sn't stigmatizing.



*I will feel safe in my everyday life because the interaction is so quick and I can reach help even though the perpetrator arms are fixed*

- Niels and Britta Jørgensen, previous victims about concept 1.



*It's important that it doesn't look stigmatizing and reminds the victim of being a victim.*

- Henriette, relative about all concepts



*It doesn't feel comfortable to wear the device around the chest*

- All asked



*If it looks like a wearable you normally wear, it will minimize the risk that the perpetrator question it.*

- Henriette, relative



*Maybe there should be training sessions so the action becomes natural for the victim*

- Henriette, relative

ill. 54: Act it out victims and relative





# EVALUATION OF CONCEPTS

## Objective

To evaluate the three concepts based on the feedback from experts new knowledge about reaction stages and the requirements.

Feedback from users, experts, relatives and research on reaction stages was used to specify the criteria. These were used to evaluate the concepts.

The ring from concept 1 created a feeling of safety because of the easy interaction. The armband or watch from concept 2 and 3 made the victim feel comfortable because it's something they can relate to. Therefore these two is combined.

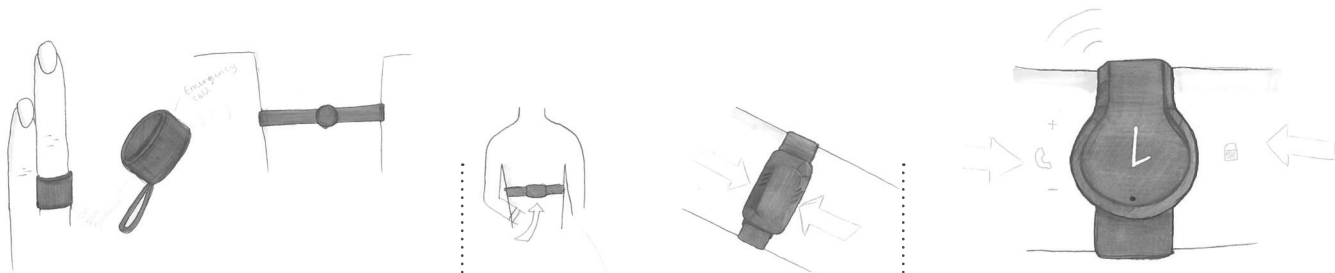
This combined concept should be further developed so it can fit the new requirement "Adapt

to the victims state of mind". Further the aesthetics have to be tried out so it looks like a wearable they are familiar with.

## Conclusion

The chosen elements is the ring from concept 1 and the armband/watch from concept 2 and 3. For further development we need to:

- Make it look like a familiar wearable
- Make the victim able to wear it in a different way in periods where they doesn't feel like a victim.
- Find the size of the solution based on the implemented technology



### CONCEPT 1: THE RING

- **Anonymous look:** It's a challenge to make the ring look like an everyday wearable. The band around the chest is very stigmatizing.
- **Quick emergency call:** It's a small motion which you can make even though your arms is fixed.
- **Discreet emergency call:** It's a small motion which makes it hard to the perpetrator to register. Also the victim can activate it behind the back without looking at it.
- **Wearable:** The rings provided a the feeling of comfortability because the interaction made them feel more safe. The band around the chest doesn't feel comfortable. Both when wearing it and when taking it on and of. It creates a feeling of being imprisoned.

### CONCEPT 2: BRACELET

- **Anonymous look:** As it looks now, it looks stigmatizing and reminds the victim of being a victim.
- **Quick emergency call:** Because of the coordination and the motion moving the hand to the chest is too time consuming. The victim can't call if their hands is fixed.
- **Discreet emergency call:** If the victim is able to stay calm and do a natural looking motion it will be discreet. But if they can't there is a risk that it's very visible.
- **Wearable:** The band around the chest doesn't feel comfortable. Both when wearing it and when taking it on and of. It creates a feeling of being imprisoned. The armband felt comfortable both because it's implementer in something that the test group was familiar with.

### CONCEPT 3: THE WATCH

- **Anonymous look:** It's good that it mimics something that we know from the everyday life. Then there is a lower risk that the perpetrator question it.
- **Quick emergency call:** It could be hard to activate because of the coordination and the hand position while using it.
- **Discreet emergency call:** If the victim can manage to activate the call without the perpetrator sees the alarm while activating it, it can be discreet. But if they doesn't, there is a risk that the perpetrator will register.
- **Wearable:** It makes the victim feel comfortable that the alarm looks and is weared as something they are familiar with. But the worries about if they can activate it in a assault situation would make them worry in their everyday life.

# APPLICATION GUIDELINES

**Objective**  
To setup guidelines for the forming of the application and how the different features within it should work.

Further development will be performed after hand-in.

The features that should be implemented in the application was divided into 6 specific areas which were developed upon to ensure the service consider the immediate need of the users. These was ideated and evaluated on according to criteria.

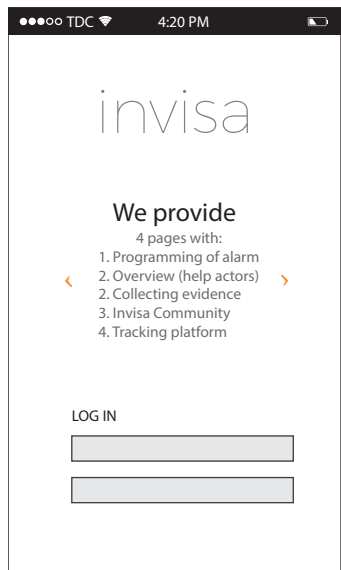
- Criteria:**
- Overview: Over their contact persons, opportunities and information about their situation
  - Mirror them self: The victim see other in the same situation as them self, to know they aren't alone in their situation
  - Motivation: should motivate the victim to revise the information
  - Clear communication: The solution provide simple and clear communication with low amount of descriptive text
  - Technical evidence: should collect technical evidence in critical assault situation (images and/or sound recording, phone calls and messages)

- The focus areas:**
1. Start-up
  2. Programming of INVISA device
  3. Platform where victim can collecting evidence
  4. Online community where the victim can connect and talk to other users of the INVISA app
  5. Provide overview help
  6. Platform for private help actors

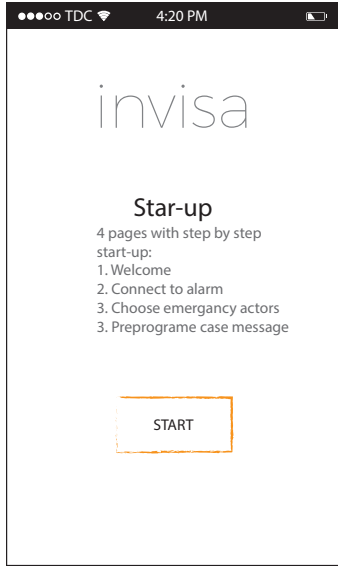


III. 56: Application ideation

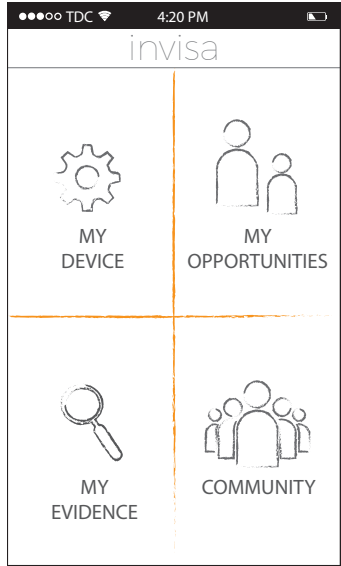
Application guidelines



**LOG IN**  
Log-in page with introduction to what the application provides. The user have to log in with a user ID and password provided a the setup consultation with the organisation or security company.



**START-UP PROCESS**  
Step by step start-up process the user have to go through with guidance of the employee at the organisation or security company.

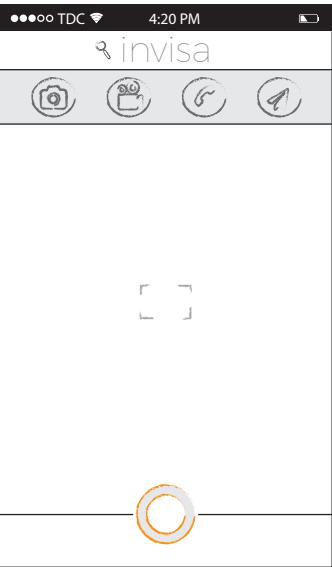


**HOMEPAGE**  
Homepage with short-cuts that lead the user to one of the four main feature platform that the INVISA application provides.

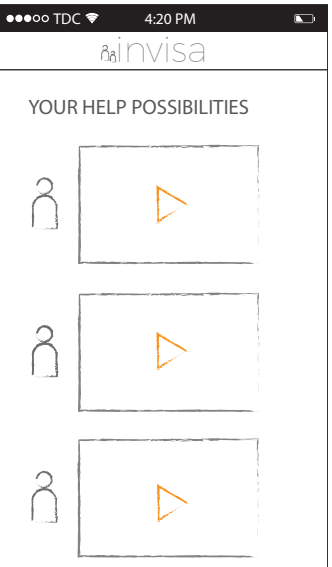
III. 57: Application guidelines



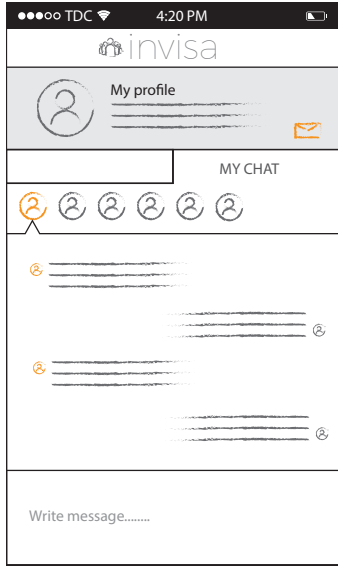
**FORUM:** where the users can ask questions and create discussion with each-other.



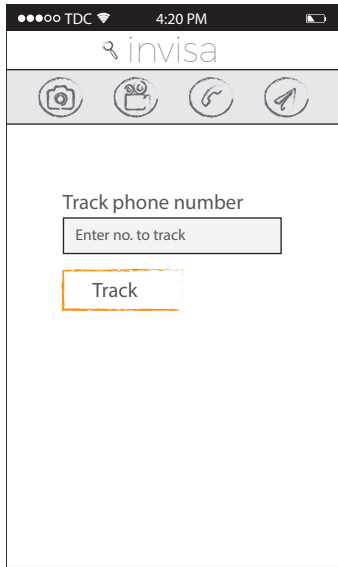
**EVIDENCE COLLECTION** feature where users can take pictures, video, track phonecalls.



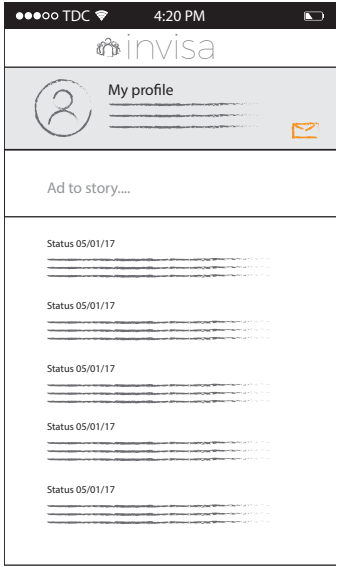
**OVERVIEW OVER HELP ACTORS.:** Overview over the different help actors and in which different ways they can help.



**PERSONAL CHAT:** where users can chat more privately.



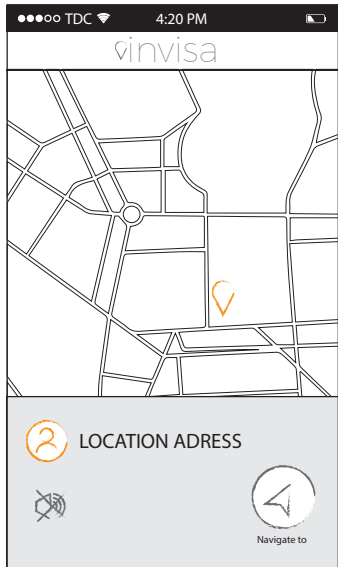
**TRACK A PHONE NO:** Log and record calls from a specific person.



**PROFILE:** each users have a personal profile where the user can share their stories.



**EVIDENCE LIBRARY** create a overview over the collected evidence and makes it simpler for the user to mail it to the police.



**TRACKING PLATFORM** for private emergency actors where they can track the location of the victim in a emergency situation.

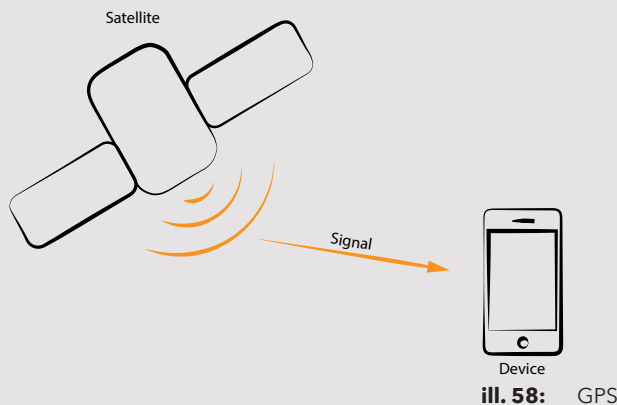


# TRACKING TECHNOLOGIES

**Objective**  
To investigate different tracking technologies which makes it possible to track indoor and outdoor.

**Global Positioning System (GPS)**  
A GPS receiver, can locate four or more satellites, figure out the distance to each and deduce your location through trilateration. For trilateration to work, it must have a clear line of sight to these four or more satellites [Frank van Diggelen].

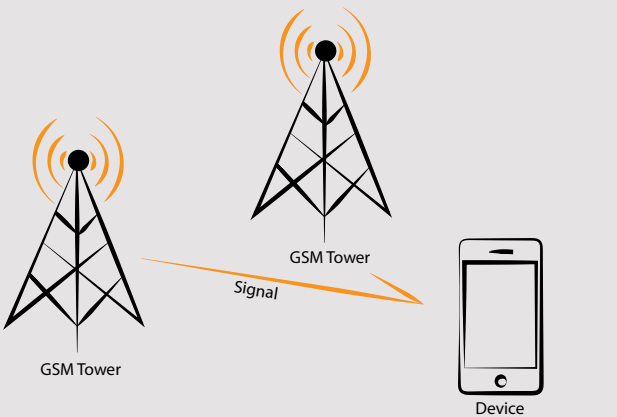
- Outdoor positioning.



ill. 58: GPS

**Global System for Mobile Communications (GSM)**  
When a cellular device communicate through the GSM network, it does so by establishing a radio connection with a nearby cellular tower. In many cases the device communicate with multiple towers that are close enough to receive a signal. All the communication with the towers are recorded by the cellular network, and can be used to track the location of the device. The radio communication does not provide any directional information, the process of GSM tracking therefore requires triangulation [Frank van Diggelen].

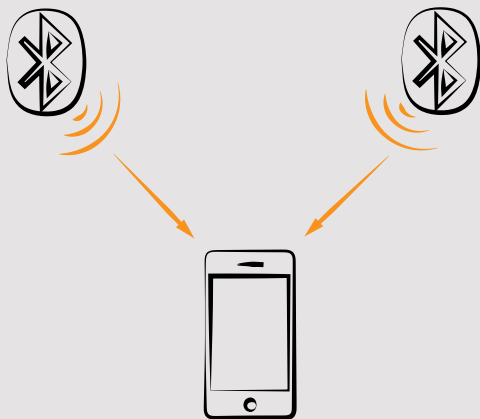
- Outdoor and dense areas



ill. 59: GSM

**Bluetooth**  
Bluetooth can be used for indoor positioning and indoor navigation. Bluetooth beacons are able to send out signals, but they can't receive them. They are relatively cheap, can run on button cells up to two years and have a maximum range of 30 meters indoor. Accuracy is up to one meter. On the one hand they are used in client based solutions, that is to say, positioning via app on the smart phone it self. In this case Bluetooth must be activated on the device. On the other hand, server based tracking solutions using beacons are possible as well[GIM International, 2015].

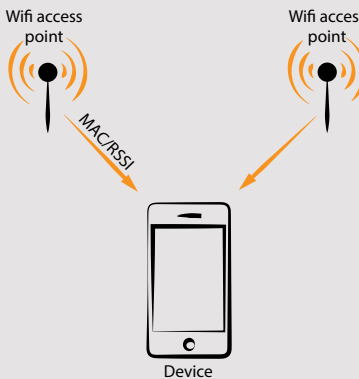
- Indoor



ill. 60: Bluetooth

**Wi-Fi positioning system (WPS)**  
WPS is used where GPS are inadequate due to various causes including multipath and signal blockage indoor. Such systems include indoor positioning systems. Wi-Fi positioning takes advantage of wireless access points in urban areas. WPS use WiFi hotspot where the WiFi card transmit a Broadcast MAC address that the WiFi modul in the device can read (An MAC address is globally unique) [International Journal of Computer Science and Information, 2014].

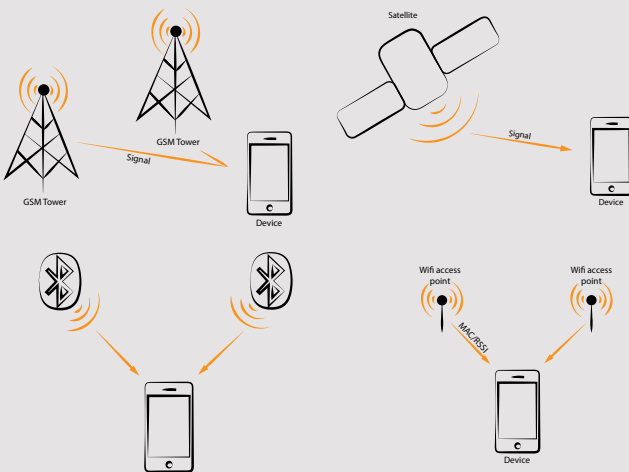
- Indoor



ill. 61: WPS

**Combination**  
To achieve a more reliable position tracking both indoor and outdoor, many companies are starting to combine the different tracking technologies to get a more precise location. This is both seen in devices for tracking cars and children. Her GPS is used for the main outdoor tracking but the GSM, Bluetooth and WiFi positioning takes over in more dense areas or indoor where the GPS can't reach. Bluetooth and WiFi tracking can also help with giving a more precise indoor location and when combined with a accelerometer also can provide data reading which floor the device/Person is one.

- Indoor, outdoor and in dense areas



**Conclusion**  
To achieve the most reliable tracking for the project solution the was made a combination of the technologies that included GPS, GSM, and WiFi together with an accelerometer. The technologies were chosen based on research on other tracking devices and a meeting with Martin Kibsgaard Jørgensen who is Research Assistant in Institute for Architecture and Media Technology at AAU. This combination of technologist can provide a more precise tracking both indoor and outdoor compared to using GPS tracking alone.

# ADJUSTABILITY - UNSAFE PERIODS

**Objective**  
Explore opportunities for the victim to adjust the way they carry the device around depending to their state of mind.

Through the feedback two state of minds were defined:


- 1. **Safe period:** Where the victim doesn't feel like a victim and doesn't want to be reminded of being a victim by looking at the device. But still they want to bring the device along in case of emergency.
- 2. **Unsafe period:** Where the victim feels like a victim, and needs the quick interaction in case of emergency.

The solution as it's now provides the quick action in unsafe periods. Solutions for how the victim can bring it along were explored through act it out.

**Conclusion**

- In safe periods the victim should be able to wear the device the way they find most comfortable (solution no. 1).

In unsafe periods they can wear the watch and ring and have the quick interaction.



**Finding no 23.** The victim should be able just to bring the watch in periods where they feel more safe.



**1 Only the armband**

The victim leave the ring at home and bring the armband/watch in their pocket or bag. On the watch the victim can activate the alarm by pressing a button.

**Evaluation**

- The victim do only have to carry one device around.
- It could force the victim to wear it also in periods where they feel safe.
- Quick emergency calls: If the victim wears it around their arm, or in the pocket they will still be able to interact quickly. But there is still a risk that the victim will wear it in a way they doesn't have quick interaction.
- If the ring disappears, or there isn't more power on it, the victim will still be able to use it.

**2 Attach ring to armband**

The ring is attach to the watch and carried around in the pocket. The victim activate the emergency call through the ring.

**Evaluation**

- The victim will have to handle two devices around which increase the risk that the ring disappears.
- Quick emergency call: It gets too complex to interact with the ring because it's so small.

**3 Wear it different ways**

The victim takes the communication unit of the strap and attach it to an other strap which makes them able for them to fix it to their keys, belt etc.

**Evaluation**

- Quick emergency calls: It could force the victim to wear it in a way where they doesn't have quick access the emergency call in unsafe periods.
- Other: The victim don't feel they are forced to wear it in one way, but they have the power to wear it the way they find most comfortable.
- The victim do only have to carry one device around.

ill. 62: Adjustability

# CONCEPT OVERVIEW

**Objective**  
To sum up the final concept and what challenges there is with the detailing.

The final solution is collected in ill.63.

**Challenges for the detailing**

- **Shape:** The shape of the device should mimic every day life wearable for both males and females. Previous investigation for shaping the product ended up being too stigmatizing. Therefore a new investigation of which categories watches and rings today and based on creating a new shape.

- **Size:** There is a risk that the components needed for the devices ends up with a too big size.
- **Price:** Many technical components is needed in a small size. There is a risk that it will be expensive.



**CORE SERVICE**

**Personal alarm**  
A watch and ring which makes the victim able to reach help quick and discreet in emergency situations.

**Tracking in and outdoor:**  
WiFi, GPS, GSM

**Calling in and outdoor:**  
GSM, WiFi

**Clear feedback:** Vibration when activating a call. Light to indicate battery level.

**Emergency call:** A button on the ring (or on the device in safe periods).

**On-spot guidance:** After activating emergency call, the sound can be turned on and of on the watch.



**SUPPLEMENTARY SERVICE**

**Application**  
The application makes the victim able to:

**Set up personal alarm:**  
Chose who the alarm should call and connect it to WiFi spots in locations they often come.

**Technical evidence:** Take pictures, record videos in the App, and it will automatic be stored. This can be send to the police as a collected package by email.

**Controlled community:** A community where victims can share stories and experiences with each other.

**Overview of opportunities:**  
Small videos of actors who tell about the victims helping opportunities.

**A PACKAGE FOR VICTIMS**

**Channels**  
Helping organizations will support the victim by:

**Training sessions:** Chose who the alarm should call and connect it to WiFi spots in locations they often stay.

**Support groups:** Set the victim in to small groups of victims in a similar situation.

**Start op sessions:** Help the victim to create a account and set the device op.

ill. 63: Final concept



# 05

## DETAILING

Details in the concept were further specified by looking at existing solutions, involving experts and building prototypes.

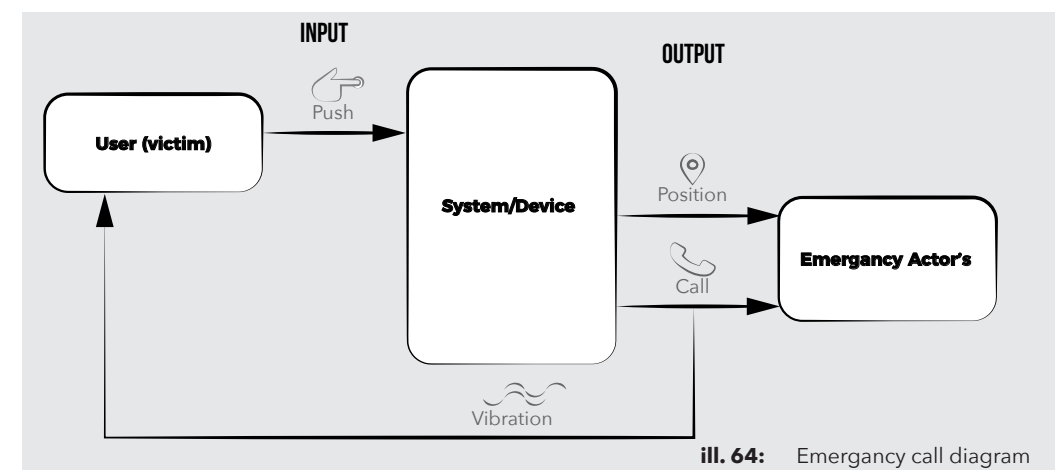
## SYSTEM OVERVIEW OVER DEVICE

### Objective

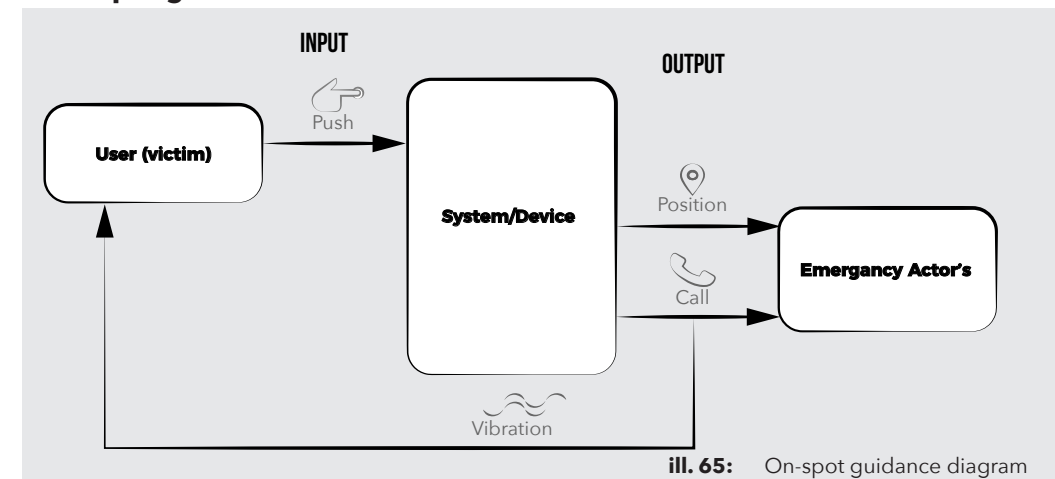
To create an overview of which input, output and feedback the device should give under a emergency call and a guidance call by making two input and output diagrams.

The two diagrams show an overall representation of which input and output the system should provide the users and the emergency actors with. This phase of the process will therefore focus on which specifying the different elements the system/device need to enable these function and and how the product should be formed to provide a optimal experience for the user.

### Emergency call



### On-spot guidance



# SYSTEM POSSIBILITIES

**Objective**  
Create an outline of which technology/ components the system should include to actualise the different function. This should be don based on the previous input output diagrams. Additionally, to elaborate if some of the function could be executed on the users phone to cut down on the needed components.

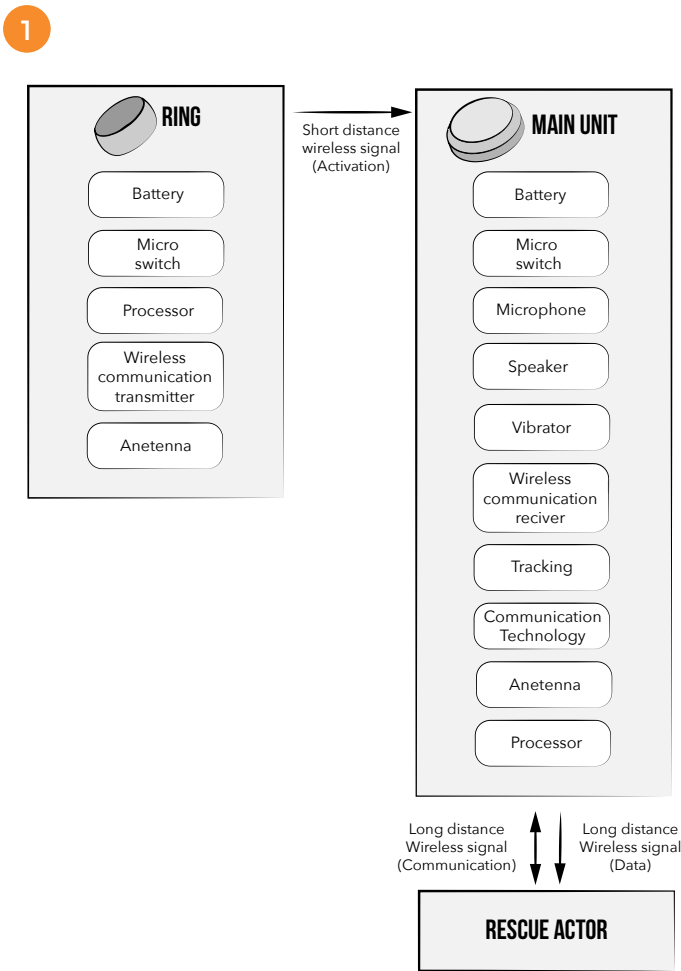
**Conclusion**  
Solution no. 1 is chosen because it lowers the perpetrator possibility to remove the victim's opportunity to reach help by remove their phone and the women's shelters and the help organisation tells the victims to turn off the tracking on their phones. With the chosen solution there is a risk that the size and prize of the device will be critical so that needs to be investigated further.

The possibilities were explored and evaluated based on following criteria:

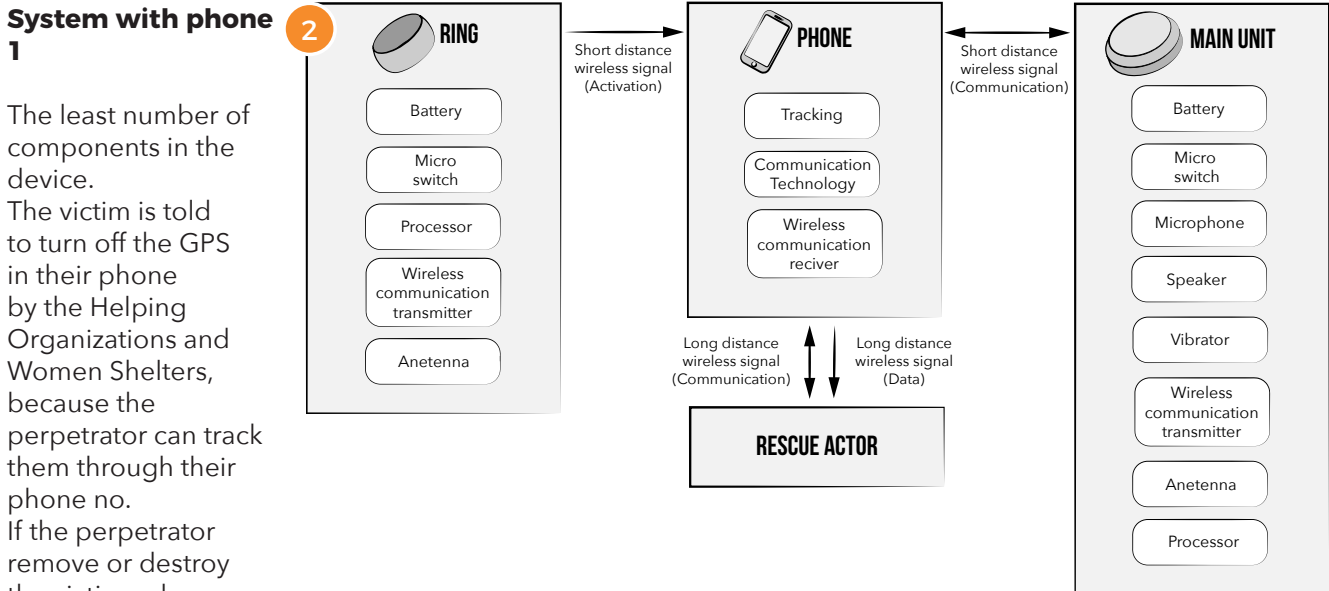
- Quick reach of help in emergency situation
- Minimum size: Least amount of components in the device.

**Device and ring**

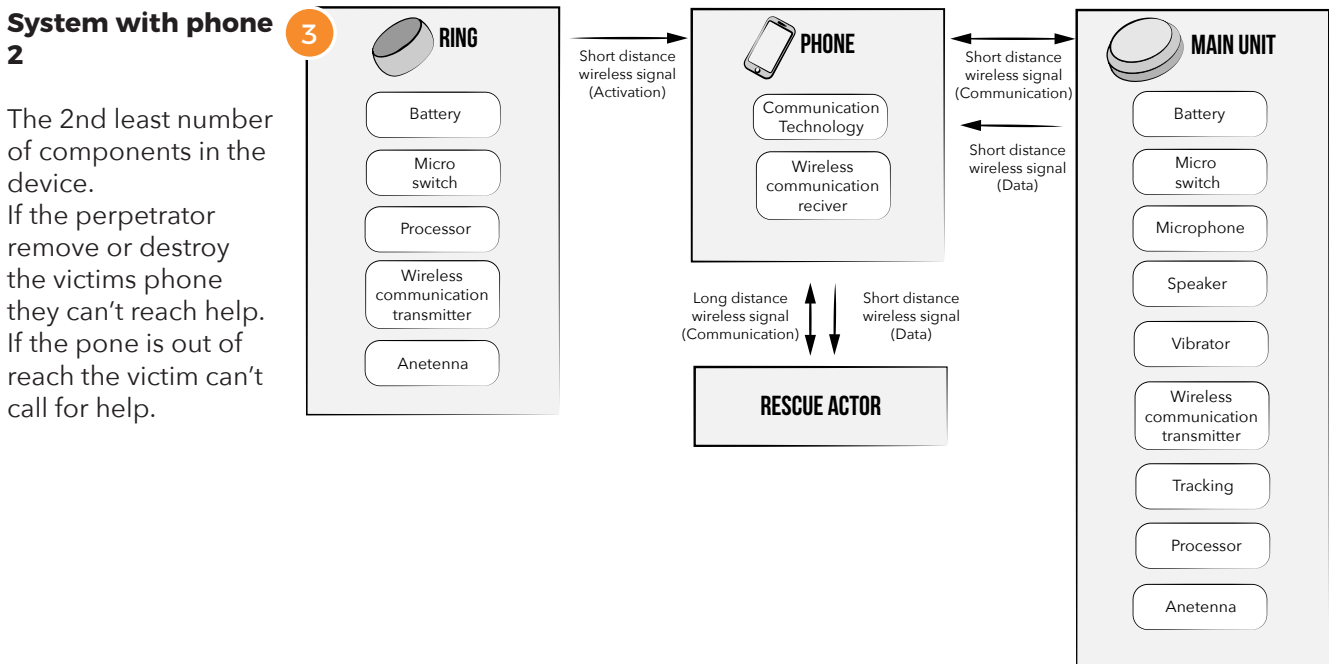
- Highest number of needed components.
- + Independent of a phone
- + Lower the risk of the perpetrator having total control of the situation by remove the victims phone.



ill. 66: Device ring diagram



ill. 67: system with phone 1 diagram



ill. 68: system with phone 2 diagram



# EXISTING PRODUCTS

## Objective

Researching on existing remote is performed to understand the overall system and which technical components are needed to make it work.

Exiting remote for eg. TV and cars is investigated. Some through desktop research and others by disassemble. Through this investigation it was found that following technical components is needed.

## Switch

The switch creates a input to the processor when it's activated by a push.

## Processor

The processor is needed to transform the input from the switch into orders for the other components. A microprocessor is enough for the product.

## Transmitter

The transmitter creates the signal which is send to a receiver in an other device when it's told by the processor.

## Battery

The battery delivers the energy to the system. As the system only uses power when the switch is activated, the energy consumption of the system is low.

## PCB

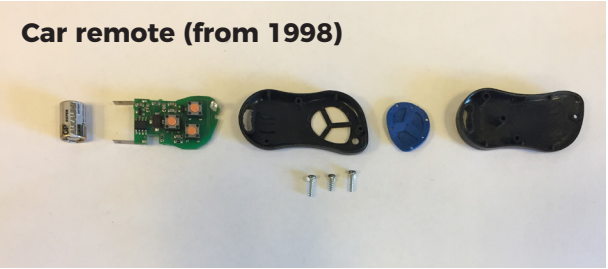
The print board is needed to connect the signal between the technical components. If we look at LED straps, it's possible to make PCB flexible.

## Antenna

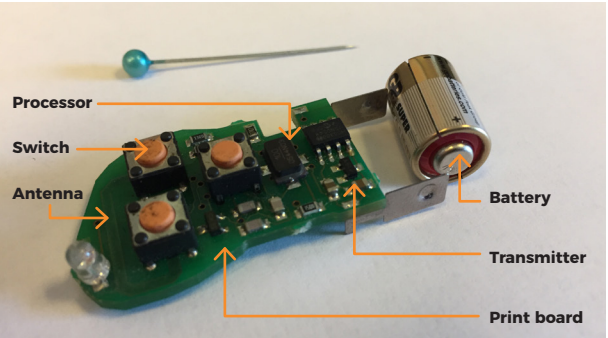
The antenna transmits the signal into a electromagnetic energy. This is radiated into the surroundings. In the car remote it's integrated into the print board. This is good for saving space.

## Conclusion

To make the remote work, following technical components is needed: switch, processor, transmitter, battery, print board, and an antenna.



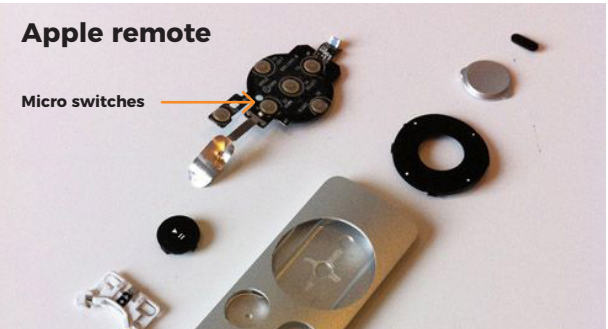
ill. 69: Remote disassemble



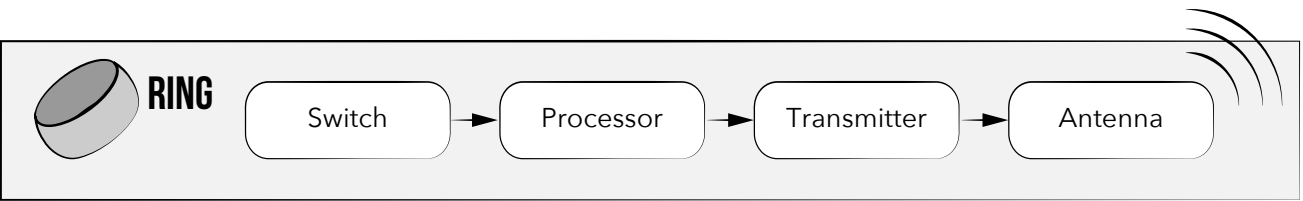
ill. 70: Technical components



ill. 73: LED



ill. 71: Apple remote



→ A signal

ill. 72: The system in our remote

# EXSISTING PRODUCTS

## Objective

To specify which components is needed to facilitate both the tracking and the two way radio communication.

The first part of the investigation was performed by studying tear-down of smartphones as well as smart watches to get insight into which components they uses to perform similar tasks to which is needed in the product solution. The investigation lead to a basic understanding of which components is used, but because of the complexity of a smart phone and the missing features within smart watches it was difficult identify the exact components that was needed. Based on this we arranged a meeting with Martin Kibsgaard Jørgensen who is Research Assistant in Institute for Architecture and Media Technology at AAU, to get some expert insight on the area.

## Meeting with Martin Kibsgaard Jørgensen

At the meeting with Martin K. Jørgensen the concept was presented together with the different features that the solution should provide user with. Here he listed following electrical components needed to make these things happen.

## CPU

The central processing unit which is the "brain" of the device

## GSM module

Too establish the two way radio communication and send data

## Tracking modules

To locate the position of the victim

## SIM

to allowing the communication between the device and the cell towers.

## Loudspeaker

To converts an electrical audio signal into a corresponding sound

## Microphone

To converts sound

## Battery

Have to convert energy to the system and are the most critical part regarding the size of the product.

## Antennas

Convert electric power into radio waves, and vice versa.

## PCB

To connect the signal between the electrical components

The tracking technology for both in- and outdoor tracking was further discussed where he suggested following:

- GPS tracking (outdoor) which need a GPS module
- WiFi tracking (indoor and communication) - a WiFi module
- Tracking via the cell towers (indoor and in dens areas)

## Conclusion

Based on the meeting with Martin K. Jørgensen the need components were identified. But to know the specific sizes of the different components, existing components needed to be found. He also told us it would be optimal if we could find SMD components which is easier for robots to assemble.



ill. 74: product teardown

# INNER COMPONENTS

**Objective**  
To find the inner components which is needed to make the solution work.

Experts were involved to get a deeper understanding of possibilities of electrical components: Martin Kibsgaard Jørgensen who is Research Assistant in Institut for Architecture and Media Technology at AAU were involved and Igor Syrytsin who is writhing PHd about antennas at AAU.

Through meetings and research the final electrical components were chosen. In the following some explored possibilities and evaluation will be outlined.

**Criteria**

**Strong connection:** The connection between the remote (ring), the base unit (armband/watch) is should be strong.

**Minimum use of power:** Min. 24 hours battery life. Device should have a minimum use of power.

**Minimum size:** To keep the device in a small size, all components were evaluated from their sizes.

**Battery indication:** Clear indication of remaining battery power.

**REMOTE (RING)**  
The needed electrical components are outlined in ill 75.

**Wireless communication possibilities**  
The signal from the ring is simple. Through the meeting with Martin it was clear a 555 Timer was the best and simplest solution. By using 3 a coded frequency is send to the base unit. The 555 Timer uses a low amount of power (only when the switch is pushed). Three 555 timers are needed to create the coded signal.

**Indication of battery level**  
It should be possible to know the level of the battery. Research showed that in the beginning we wanted a light in on the ring indicating when it's time to charge the ring. This investigation showed the LED would use to much power and will require a big battery in the ring. If the battery level is indicated on the base unit, a smaller battery can be used. Therefore the ring should sends a signal to the base unit which will give feedback to the user about when it's time to charge the ring.

For this a Voltage Comparator is needed to measure the level of the battery, and a micro controller which is programmed make the 555 timer inform the base unit about the level of the battery.

**Antenna**  
The antenna will be integrated with the PCB, as shown at ill. 79 to save space. Through a meeting with Igor (the antenna expert) it was founded we need an antenna which is 57mm long. It's important the antenna isn't in contact with conductive materials because it will weaken the antennas performance.

**Battery life**  
The battery should be rechargeable. Each time the ring is activated it uses **150µA**. An LED on the ring for feedback of the battery level used too much power. The ring should send a signal to the base unit which will indicate the battery level. The Voltage Comparators, micro controller and 555 timers uses **456µA** per hour to inform the base unit about the battery level. The micro controller and the voltage comparator shouldn't be active all the time but in time intervals. eg. one second each minute. That will be **1.440sec (0.4h)** a day.

$456\mu A \cdot 0.4h =$   
**182.4µAh (0,1824mAh)per day**

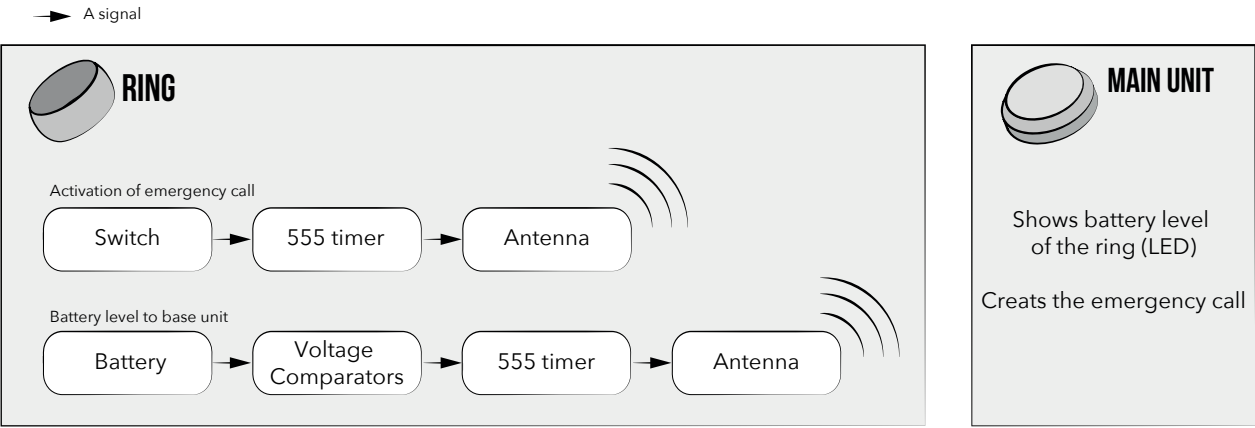
The chosen battery has 7mAh capacity. This means that the battery can last for **38 days** (standby). Probably a bit shorter because it looses power over time.

**Charging**  
Charging of the ring and base unit happens wireless. For wireless charging a Wireless Charging Receiver module is needed. The smallest SMD module is chosen to safe as much space as possible.

**Remote (ring)**

no.	Pcs	Component	Size LxBxH [mm]	Price [DKK]	A
A1	1	Micro controller: (AT24C512C)	3.99 x 5.05 x 1.75	1000: 5,242	6.0 µA
A2	1	Voltage Comparators: (LM397 - SOT-23 (5))	2.90 x 1.60	1000: 2.345	300 µA
A3	1	Tactile Push Button Switch SMD (EG4620TR-ND)	4.5 x 2.25 x 0.55	0.5	-
A4	1	Flexible PCB		1	-
A5	3	555 timer SMD: (LMC555 - DSBGA)	1.43 x 1.41 x 0.5	0.5	50µA
A6	1	Implemented flexible PCB antenna	57		-
A7	1	Wireless charging resiver SMD: (TS81001)	2.9 x 2.9 x 0.75	1000pc: 11.086	-
A8	1	Battery: Vetra RTC 6 Rechargeable Ni-MH Button 1.2V	D:6.8 x H:2.15	1000pc: 9.641	Capacity: 7mAh

ill. 75: Electrical components for the ring



ill. 76: Relation between inner components



BASE UNIT (WATCH)

The needed electrical component are outlined in il. 80

Calling and tracking

GPS, GSM and WiFi modules are used to track and call. The Three modules were chosen based on functionality and size. [Dennis Foo Kune,2012]. [Frank van Diggelen] [International Journal of Computer Science and Information, 2014].

Central processing unit(CPU)

The CPU is the device controle unit and the component interpreting and executing most of the commands from the devices hardware and software. When choosing a CPU for the device it is important it's of a type which have the capacity to receive and translate input from the other components in the device, therefore there were looked at CPU's used in phones and small devices.

Speaker, microphone and vibrator

A speaker and a microphone is needed to establish the call. It should also have a vibrator to provide feedback when the call are connected. The three components are used in smart phones.

SIM

When choosing SIM-card for the device there was looked at two possible solution a micro SIM card with a card slot and a embedded SIM which are small programmable chip. The Embedded SIM was chosen because it has a much smaller size and doesn't require a SIM-slot.

Antenna

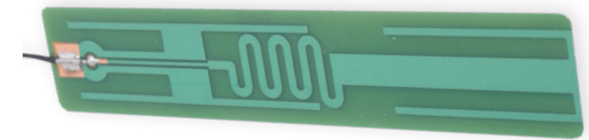
The length of the different antennas were found with the help of Igor A. Syrytsin from the institut for Elektroniske Systemer Antennas, PHD in propagation and radio networking. The GSM and GPS antenna should be abut 95 mm long and the WiFi antenna about 57 mm. The antenna will be integrated in the PCB, to minimize the used space. It's important that the antenna isn't in contact with or surround by a conductive materials because it will weaken the antennas preforms.

PCB

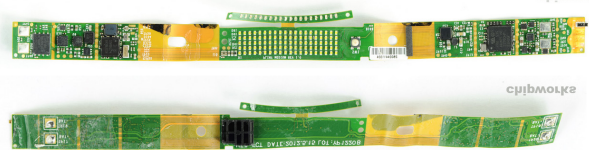
The PCB board used in the device can be both of Rigid PCB, Felx PCB or Rigid-Flex PCB according to the shape of of the final product. Ridgid flex PCB is used in the Nikes Fuelband as shown on ill. 78-79. The flexible PCB and it can help utilize usable space as efficiently as possible by speading out the components. [chipworks.com]

Battery

The battery was chosen based on other products with the same type of tracking and communication technique. Battery (lithium polymer battery 3.7 V) 450 mAh and can provide the device with 5 days standby time and 3 hours constantly working[ebay.com].



ill. 77: Antenna in PCB



ill. 78: Nike Fuelband



ill. 79: Nike Fuelband

	no.	Pcs	Component	Size LxBxH [mm]	Price [DKK]	w
	B1	1	CPU(MT6261A) SMD	8.20 x 7.70 x 1.05	34,98	1
	B2	1	GPS(MT3336) All in one solution SMD	6.10 x 6.10 x 0.90	1000pcs: 25,08	Acquisition: 0,024 W Tracking: 0,017 W AlwaysLocate: 0,003 W  14.8 mA
	B3	1	WiFi SMD (MT5931)	5.10 x 5.30 x1.200	20 pcs: 53.52	Sleep mode: 75 µA 15 mA 3,3 V
	B4	1	GSM/ GPRS SMD (MT2502) (Modulet har også bluetooth)	5.30 x 6.10 x 1	1000+: 35.65	Stand by 30mW 3,3 V
	B5	1	Embedded SIM (AnyNet)	6 x 5 x 1(Max)	20pc: 2,38	
	B6	1	Vibrator SMD (LRA Y625)	6 x T2.6	1000: 10.49	100 mA 0,16 W
	B7	1	Speaker SMD (AAC0916)	9 x 16 x 3	1: 5.60	
	B8	1	Mictophone SMD (SDM0401B)	4 x 3 x 1	55.96	1.64V 3.6V  Consumption max 550µA
	B9	4	Tactil push button switch SMD (EG4620TR-ND)	4.5 x 4.5 x 0.75	0.5	
	B10	1	Wireless charging resiver SMD (TS81001)	2.9 X 2.9 X 0.5	1000pc: 11.08	3
	B11	1	LED (WHITE SMD 0201)	0.65 x 0.35 x 0.2	1000pc: 1.658	5mA 2.9 V
	B12	1	Battery (lithium polymer battery 3.7 V)	30 x 25 x 6	500pc: 88.616	450 mAh
	B13	1	G-sensor (Accelerometer) (ADXL335)	4 x 4 x 0,35	20.99	-
	B14	1	Felxible PCB	-	-	-
	B15	1	GSM Antenna	95 mm wire	-	-
	B16	1	WiFi Antenna	57 mm wire	-	-
	B17	1	GPS Antenna	95 mm wire	-	-

ill. 80: Nike Fuelband

# CHARGING PRINCIPLES

**Objective**  
To explore ways of charging the battery in the device.

Charging scenarios was set up and evaluated. Through the investigation there was ideated on how the risk of the product running out of power when the victim is on the go. Further it should be easy for them to handle the product.

**Evaluation**

- **Principle 1:** The victim will only have to worry about to charge the devices. This is the principle which have the least actions. It could motivate the victim to charge it from home if they don't have a back up battery.
- **Principle 2:** The victim will have to handle one more battery on the go and remember to charge it. There are a risk it could force the victim not to charge the device at home, if they know that they can do it on the go. It could make the victim feel more safe that they have a back up.
- **Principle 3:** The victim only have to worry about charging the device. The micro generator is a backup which mean that they can produce power, also if they doesn't have a charger.
- **Principle 4:** The victim will have one more part to carry around. Further they can't use the alarm while it's charging.

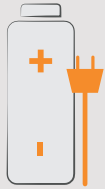
**Conclusion**  
The solution should have a rechargeable battery, and charger. It a micro generator isn't needed because the battery life is 38 and 5 days.

**Finding no 24.** The device should have a rechargeable battery and charger.

The principles were evaluated on following criteria:

**Motivation:** The solution should keep the amount of actions the user have to perform on a minimum.

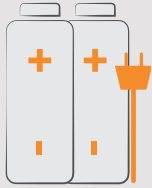
1



**RECHARGEABLE BATTERY + CHARGER**

There are one rechargeable battery in each devices.

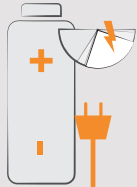
2



**RECHARGEABLE BATTERY + EMERGENCY BATTERY + CHARGER**

The victim have two rechargeable batteries - one in the device and one which they can have on the go as a back up.

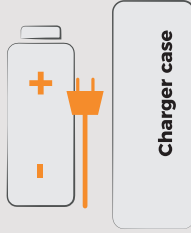
3



**RECHARGEABLE BATTERY + CHARGER + MICRO GENERATOR**

There are one rechargeable battery and micro generator which generates power in motion and a charger in case that the victim doesn't move enough.

4



**RECHARGEABLE BATTERY + CHARGER + PORTABLE CHARGER CASE**

There is one rechargeable battery in the product and a charger. Further they have a portable charging case which enable them to charge the devices on the go.

ill. 81: Charging principles

# ELECTRICAL COMPONENT ARCHITECTURE

**Objective**  
To investigate the composition of the inner components in both the base unit and the ring and to explore different arrangement according to how much space they takes up.

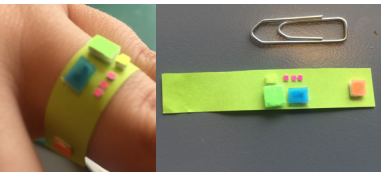
The investigation was inspired by quantitative structuring where the components was mocked op in foam in a 1:1 scale. The components were then combined in different setup.

**Conclusion**  
The investigation showed that there was a broad range of compositions in which the electrical components could be placed, some with the use of flex-PCB other with ridgid-PCB or ridgid-felx PCB. But as an output, the investigation was only

used to explore the different possibilities of how the different components could be placed but a specific composition was not chosen. The product parts had to be more developed according to the aesthetic representation before choosing the final composition. But the investigation showed it was possible to create a device that could be small enough to place both on the finger but also on the wrist.

**Finding no 25.** It's possible to make a device of a size that are realistic to place on the finger or the wrist.

RING




H: 2.65mm  
W: 20mm  
B: 10mm

**Composition 1**  
The components are placed on felx-PCB. Most of the components is placed in a square which can fit on the top of the finger and the button is placed on the underside.

**Composition 2**  
The components are placed in a line on felx-PCB around the finger which give the possibility to make the with of the ring smaller.

BASE UNIT



H: 7.5mm  
W: 26mm  
B: 33mm

**Composition 3**  
The components are placed on a ridig-PCB on top of the battery.

**Composition 4**  
The components are mainly placed on a Rigid-Flex PCB on top of the battery but the speaker and the vibrator are placed on the side.

**Composition 5**  
The components are placed besides the battery on a flix PCB. The placed within the same width as the battery.

**Composition 6**  
The components are placed on both sides of the battery. One of sites with the same width as the battery and the other in a line.

**Composition 7**  
The components are placed on besides the battery. In both sites the wide gets smaller then the battery.

ill. 82: Compositions



# ANALOGUE VS. DIGITAL CLOCKWORK

**Objective**

To explore which type of clock works that exist today and investigate the possible size and power consumption.

The investigation is based on desktop research and evaluated on following requirements.

- Minimum size
- Minimum energy consumption
- Anonymous look
- Consistent performance

**Analogue clockwork**

There exist different types of analog clocks where quartz clockworks/ movement is one of the most common types. This type of clockwork is reliable, low cost and have a very low power consumption and can be purchase in a fearly small size.

The thinnest of these types of clock movements can T2m x D20.5 mm [anytimewatches.com].

**Digital clock**

A digital clock are more precise when it comes to showing the precise time compared to an analog clockwork, but they have a higher power consupntion and the can be purchased very thin size.


A digital clock movement is about 2-3 mm thin[anytimewatches.com].

**Conclusion**

The analogue watch was chosen and because of its low power consumption, analogue look and fearly small size. If the digital watch had been chosen it was feared that it would make the project solution look to much like a digital device and require a larger battery.

**Finding no 26.** The solution should have an analogue clock.

1




**ANALOGUE CLOCK**

- + Reliable
- + Cheap
- + Low power consumption (Normal about 3 years with a small battery)
- winding
- + Can be made in small sizes
- + Analog Look

ill. 83: Analogue

2



**DEGITAL CLOCK**

- + Are more precise
- + Can be made in small size
- High power consum ption
- Can be made in small size
- Have a digital look

ill. 84: Digital

# STYLE BOARD

**Objective**

To create a new style board based on previous identity and investigation of everyday wearable expression.

To express safety and power the previous defined direction "soft edges" should be the characteristics of the shape. To make the devices undercover it should mimic a watch and a ring. Materials, shapes and colours were defined from analysing common unisex watches and rings.


**Conclusion**

The colours should be a combination of warm and neutral. The lines are soft edges and the materials can be metal, plastic, textile and leather with soft and shiny surfaces.

COLOURS

SHAPE

SURFACES



Leather      Wilted wool      Matte metal      Matte plastic

ill. 85: Storyboard



# SHAPING BASE UNIT

**Objective**  
To specify the aesthetics expression of the base unit.

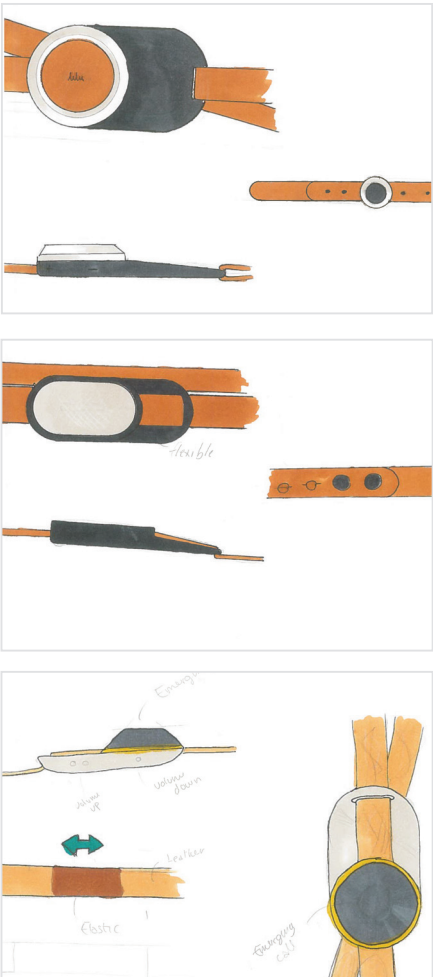
The investigation was initiated with inspiration in the constructed story board and two inspiration boards with locking mechanisms and the transition between arm strap and pendant. The task consisted of two rounds of ideation with marker sketching followed by one round 3D sketching in SolidWorks.

The ideas was evaluated on following criteria:

- Anonymous look
- A natural interaction

**Conclusion**  
The ideation ended in three aesthetic direction too further testing and evaluation.

**Round 1**  
After the first round of sketching the three sketches that fitted the criteria the best was chosen for further development.

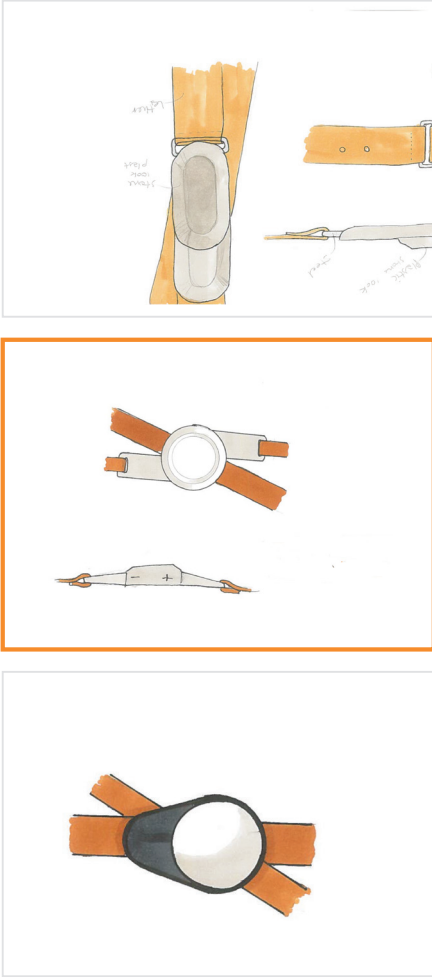


ill. 87: Ideation



ill. 86: Inspiration board

**Round 2**  
Sketch number two was chosen because of it's shape was the one that mimiced a watch the best. The aesthetical direction was further explored in Solidworks to get a more denominational base to evaluate on.



**Round 3**  
This round of 3D sketching ended op in three directions which had different transitions into the strap. but before choosing a final one each idea was 3D printed for further investigation.



ill. 88: Evaluation of sketches



# SHAPE EVALUATION

## Objective

To choose the shape of the base unit from three 3D printed mock-up's based on two chosen aesthetic directions.

The evaluation of the shape was preformed through an act where the following scenarios were tested:

- Anonymous look
- A natural interaction

## Conclusion

The shape chosen was a combination between shape 1 and 2. No. 1 was more natural to interact with because of the placement of the strap holder and the gave more space to the buttons and the placement of the hands. But strap holders on the shape three looked more discreet than on shape 1.

**New finding:** The shape of the base unit show be a combination of shape 1 and 2.

### Shape 1



- **Anonymous look:** The shape looks like a watch but there can be worked further on the wings to make them more discreet.
- **Natural interaction:** Shape 1 felt most natural when interacting with because the asymmetric placement makes it possible to locate the buttons in a way that resulted in a comfortable hand-position.

### Shape 2



- **Anonymous look:** The shape is very similar to a normal watch and the closed wings followed the aesthetic of the style board
- **Natural interaction:** The interaction didn't feel as natural as shape 1 because of the placement and size of the strap holders didn't live as much room for the buttons which means the victims hand position is uncomfortable.

### Shape 3



- **Anonymous look:** The shape 3 is the one of the three shapes that look the most like a normal watch because of the way the straps are attached
- **Natural interaction:** As with the shape 2 the was not as much room for the placement of the buttons because of the strap holders which required the user should twist it's hand a little more which felt more unnatural.

ill. 89: Evaluation of shapes

# INTERACTION

## Objective

To lower the risk of mistaken calls and keeping the quick activation calls by define how the buttons should be used and shaped.

Principles were outlined. The challenge was to find the balance between the too easy solution (high risk of mistaken calls, good in emergency calls), and a too complex solution (low risk of mistaken calls, easy to activate in emergency situations).



Criteria:

- Minimum coordinating motions
- Lower risk of mistaken call
- Quick interaction

Through act it out, following principles were chosen.

### Ring and watch: Emergency call

On the ring and the watch it was chosen that the emergency call should be performed by making to short presses on the emergency button. Based on act-it-out it was easiest action to make but also seemed hard to do by accident. In the emergency is also seems like one of the ones which required the least coordination. Solution two was therefore the solution that combined the criteria's best.

### Watch: On-spot guidance watch

When performing in a guidance call the victim has more time to react. It's important the victim doesn't switch to a guidance call by mistake because the device will emit sound. Two buttons require coordination and that the buttons are pushed at the same time which is hard to do by mistake. "2 buttons at the same time" is chosen for on-spot guidance.

### Lowered button

The lowered button makes is possible for the victim to feel and minimizes the risk of mistaken calls at the same time. Therefore this is chosen.

## Conclusion

For emergency call on the ring and the watch, 2 quick presses are chosen. For on-spot guidance, 2 buttons at the same time. All buttons should be lowered.

Final combination

### USE OF BUTTON

**Press and hold (3 sec)**

**2 buttons at the same time.**

**2 short bush**

**1 long (3 sec) and 1 short push**

ill. 90: Interaction possibilities

### BUTTON SHAPE

**Lowered button**

**Change in surface finish change**

ill. 91: Surface possibilities

# PRODUCT TEARDOWN

**Objective**  
To explore construction principles teardowns of existing products were preformed. The focus were to find principles for assembly between the shells, buttons, to fix the inner components and locking mechanism.

The the construction principles were evaluated based on the criteria: Water and shock resistant.

**Waterproof**  
To make the products waterproof a rubber gasket is implemented between shells or the parts are glued together.

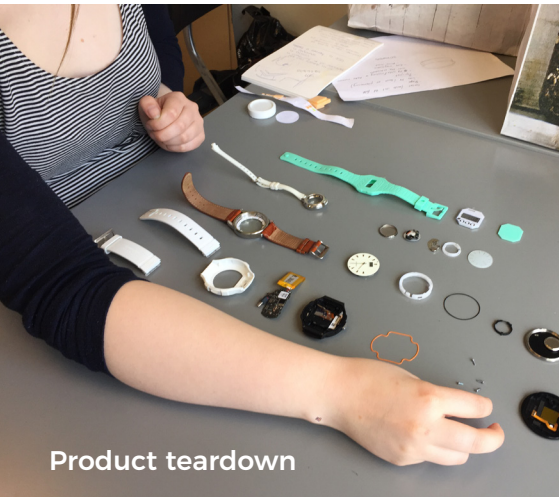
**Assembly of shells**  
Drop tests showed the product which used screws and glue to assembly the shell parts preformed the best result in resisting shock.

**Buttons**  
Testing buttons on existing products showed the click button gave the best feedback, and were hard to activate by accident.

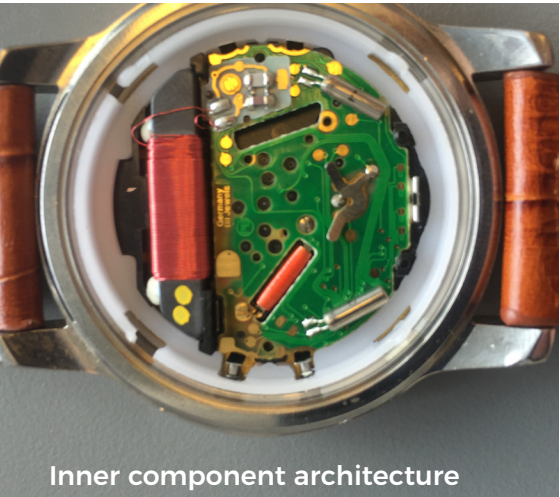
**Fixing inner components**  
Support in shell is chosen because it will require the less components.

**Adjustability**  
The classic watch clasp will make the watch look like other watches, it fixes to the arm and it's safe according to not opening while wearing it.

**Conclusion**  
The shells should be assembled by screws and/ or glue. The buttons should be click buttons. The adjustment mechanism on the strap should be a classic watch clasp.



Product teardown



Inner component architecture



Adjustable testing

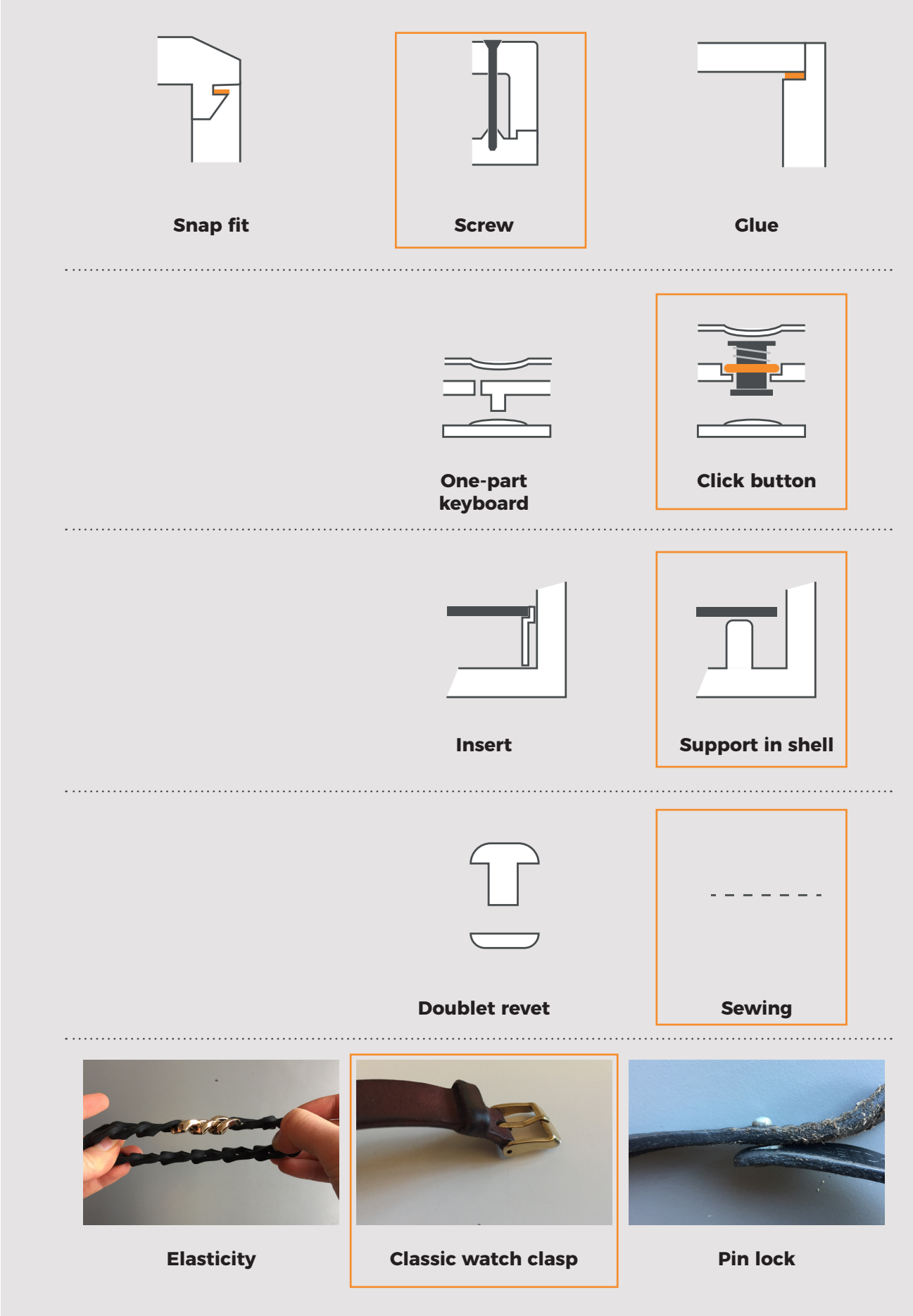
ill. 92: Product teardowns



Adjustable testing + assembly between base unit and strap

## CONSTRUCTION PRINCIPLES

Chosen principles



ill. 93: Construction principles



# PRODUCT COMPONENTS

## Objective

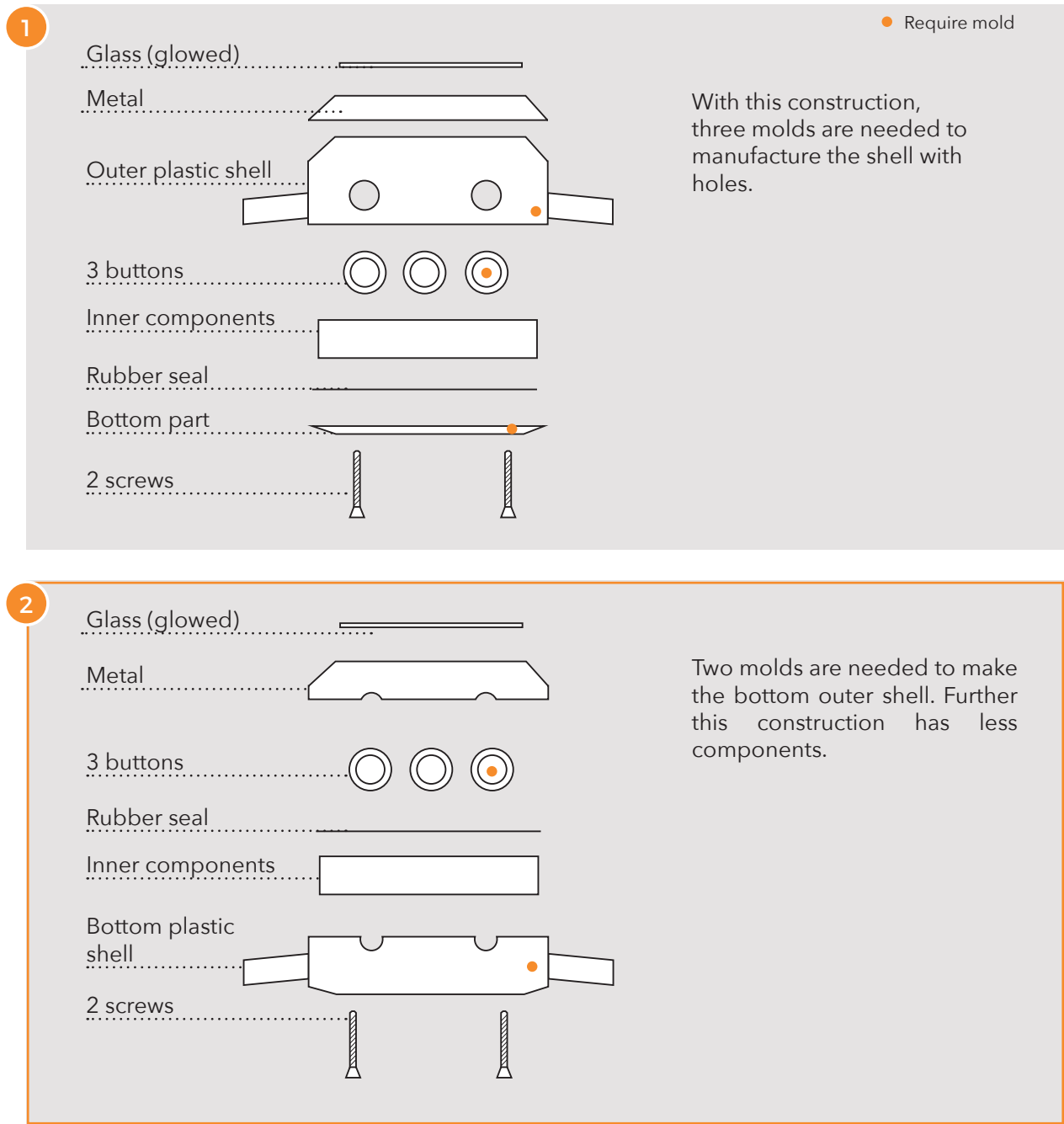
To explore and evaluate possibilities for the components of the watch.

The two opportunities showed bellow is using the same amount of components. Construction possibility 2 is chosen because it needs the least amount of moulds to produce.

For not to weaken the antenna's performance, the outer shell can't be produced in full metal. To make it look like a normal watch, it's necessary some of the material is metal.

## Conclusion

Construction possibility 2 is chosen.



ill. 94: Product parts

# PRINCIPLES FOR RING

## Objective

The ring needs to fit different finger sizes and be fixed on the finger (no rotation).

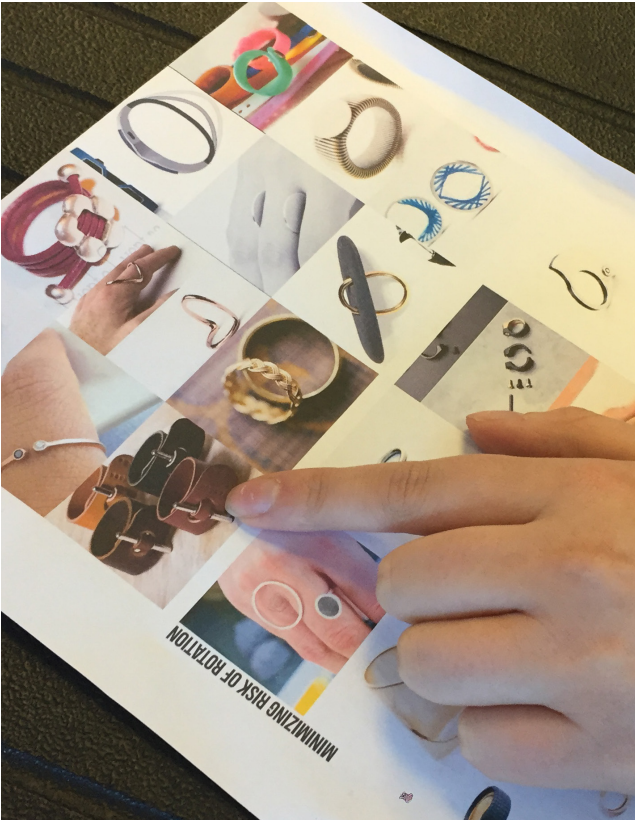
A research upon principles in existing products makes it possible to meet the criteria.

- Minimal risk of rotation
- Fit different finger sizes
- Anonymous look

The ring should cover as many sizes as possible so a less amount of different sizes is needed to produce. The principles is outlined bellow.

## Conclusion

Based on tests principle 2, 4 and 5 were chosen because they use the least numbers of molds and looks most discreet.



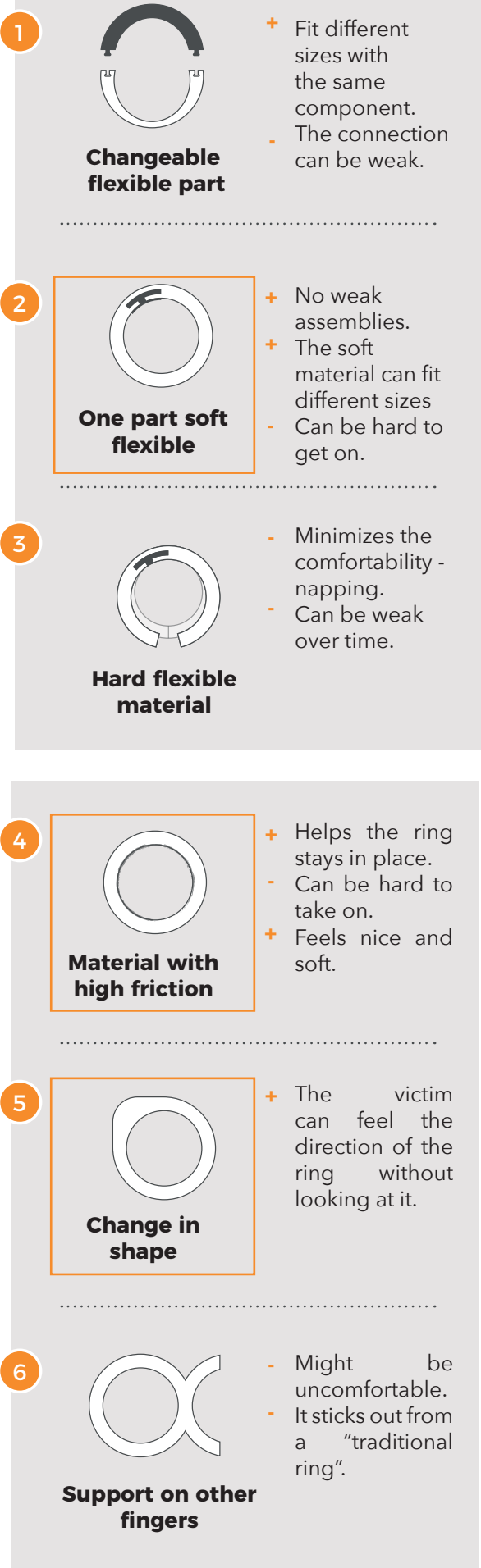
ill. 95: Ideation board rings

## CONSTRUCTION PRINCIPLES

Adjustability

Chosen principles

Lower risk of rotation



ill. 96: Ring principles

# CONSTRUCTION OF THE RING

**Objective**  
To explore and outline the construction of the ring.

Through research on existing products the construction of the ring was outlined.

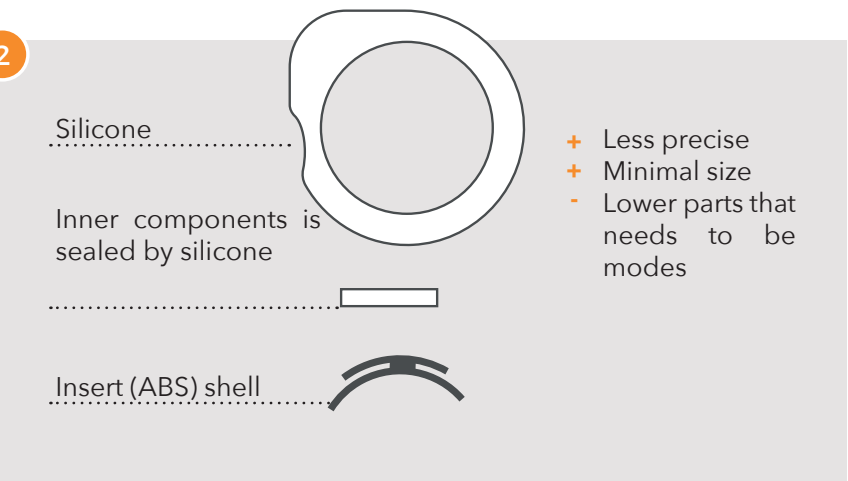
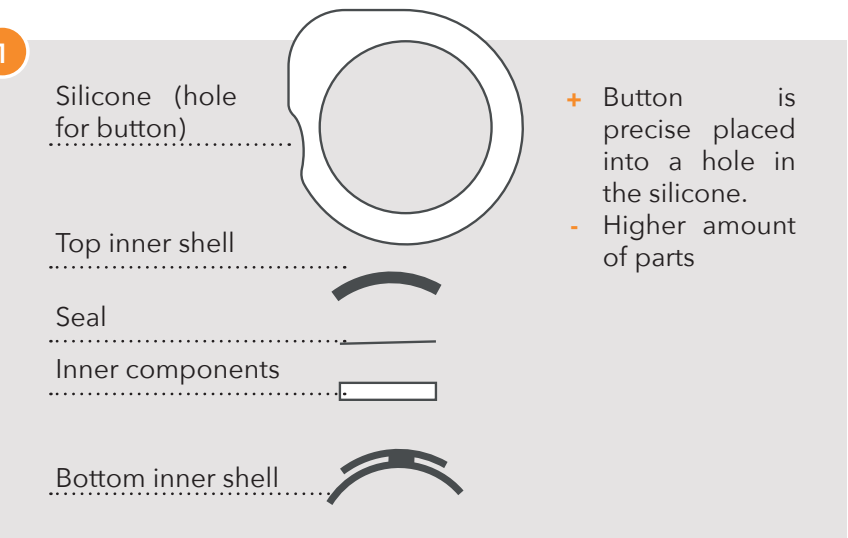
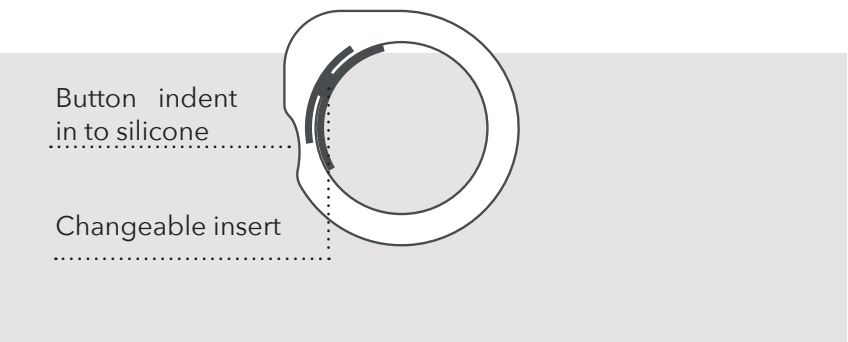
- Changeable electronics
- Waterproof
- Resists shocks

It's important that the push button is placed correct according to the buttons shape in the ring.

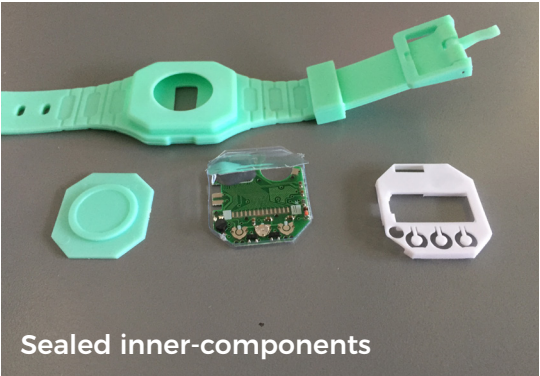
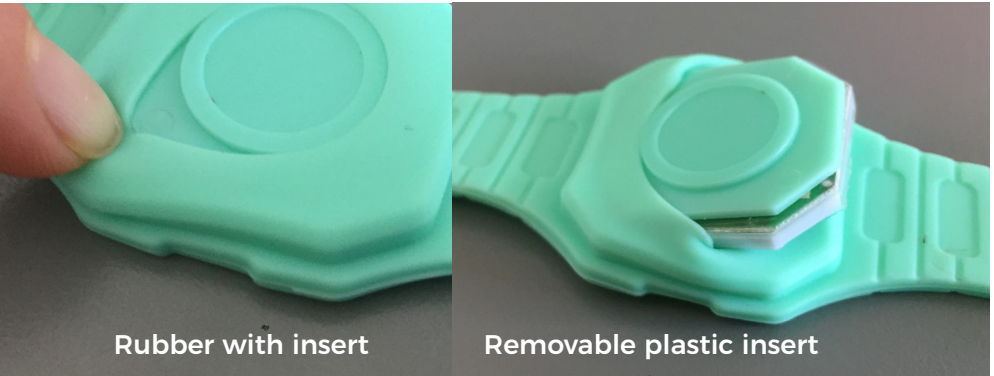
The inner components should be sealed.

**Materials**  
Silicone: Resists shock  
ABS: Resistant  
Seal: Waterproof

**Conclusion**  
Construction possibility 2 were chosen because it requires less components and can provide the smallest size.



ill. 97: Construction Principles



ill. 98: Silicone watch teardown

# RING SIZES

**Objective**  
To define what finger sizes the ring needs to cover, jewelry stores were interviewed and desktop research on how many sizes existing of smart rings offers were performed.

- Criteria**
- **Comfortable:** the ring should feel comfortable on the victims finger
  - **Manufacturing cost:** minimal production cost

**Interviews with jewelry stores**  
Though interviews jewellery stores of the most common finger sizes is:

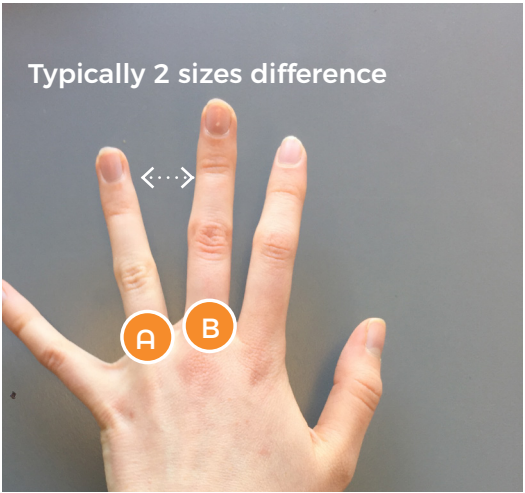
- Young women: 50-56
- Elderly women: 56-58
- Men: 65-68

Often the difference between the finger A and B on ill 99 are 2 sizes. Therefore one ring can cover two sizes.

**Desktop research**  
Other smart rings on the market often covers 7-9 sizes from ring sizes U48 -U68.

Sizes:  
49, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68

**Conclusion**  
Based on the defined finger sizes two scenarios of how many sizes the solution should offer were listed. Proposal no. 2 was chosen because the victims need to feel comfortable wearing the ring on an everyday basis. But the rings will also be produced in the one mold so it doesn't affect the mold price that much because of the small size.



ill. 99: Finger sizes

**1 4 SIZES**  
The ring can cover two finger sizes by being a little elastic.

- There is a risk that the victim can't get a ring which fits their finger size.
- + The amount of components is lower.

**2 11 SIZES**  
The ring is produced in 9 different finger sizes.

- + There is a better chance that the victim can get a ring which fits their finger size.
- A higher amount of components. These can be produced in the same mold.



# SHAPING THE RING

## Objective

To define the shape and expression of the ring.

## Criteria

- **Comfortable:** the ring should feel comfortable for the victim
- **Interaction without looking:** The victim should be able to feel the direction of the ring and the location of the button
- **Anonymous look:** The ring should look discreet and not stigmatizing

## Testing

Different shapes were mocked up in Solid Works and prototyped. The shapes were based on the sizes and placement of the inner components. These were evaluated with the users

The shapes were tested with users.

## Development of shapes

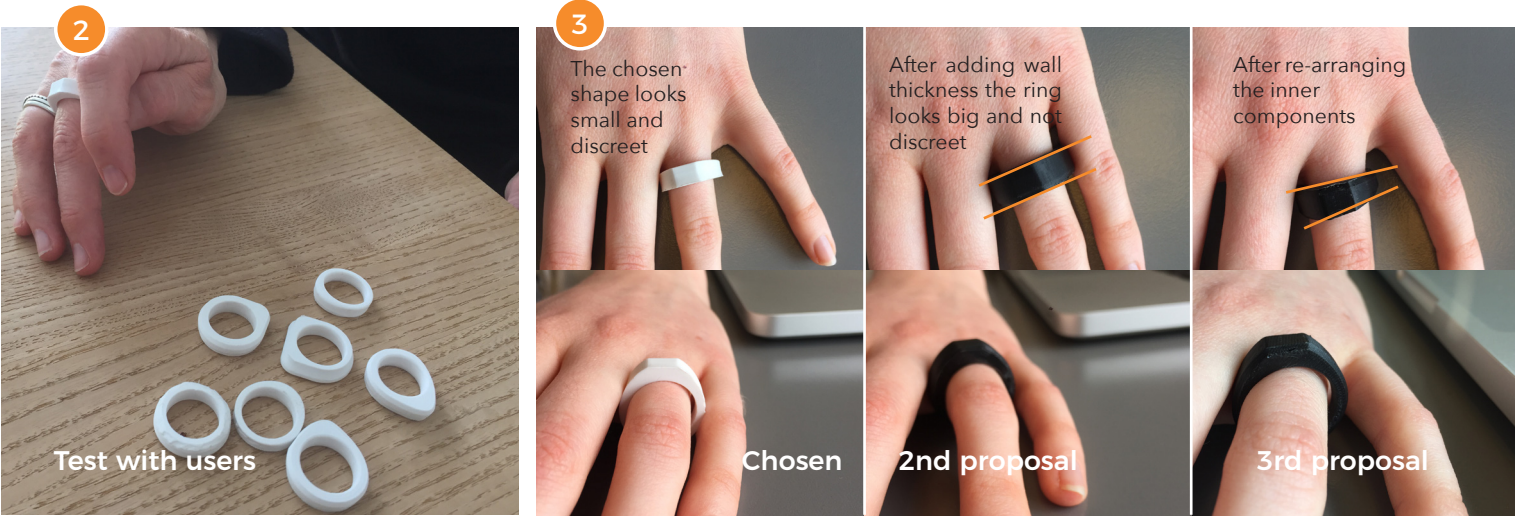
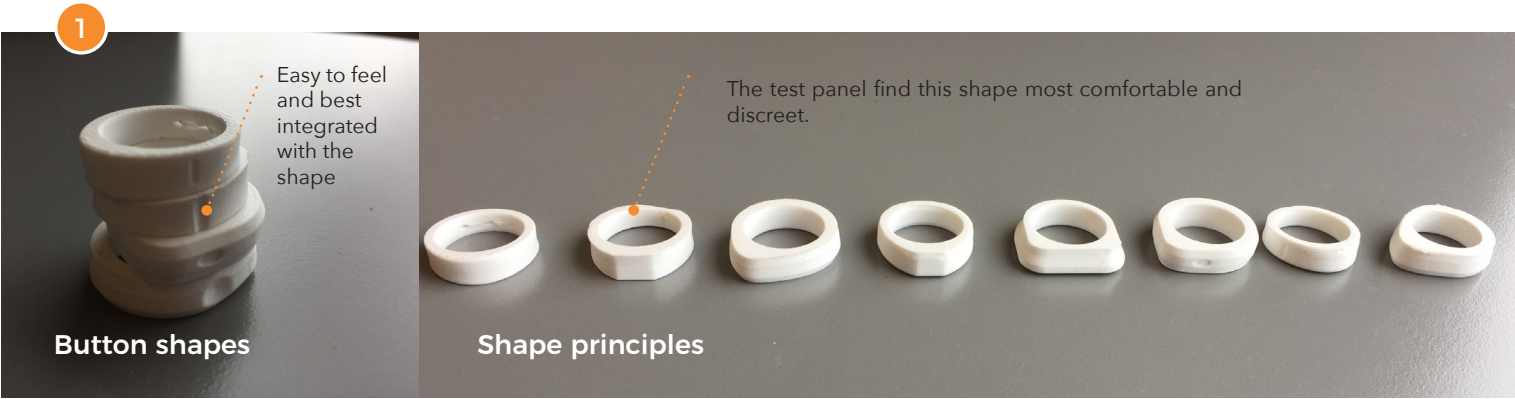
After adding the inner components and wall thickness to the shape, the outer shape got too big and clumsy. Therefore re-placement of the components were preformed in order to minimize the size.

The watch and ring should be visually connected. It was therefore played with integrating chamfers in the shape which also helps making the ring look smaller.

## Conclusion

Through tests with users a shape of the ring were defined. There were some challenges with making the size being small enough. After reconstructing the inner components and making asymmetric cuts, the ring came to look more discreet and visually connected with the watch.

1. Shape principles
2. Testing shapes with users
3. Integrating shape with construction



ill. 100: Shaping of ring



# MATERIAL AND MANUFACTURING

**Objective**

To define in which ways the different product components are manufactured and which material they should be produced in.

[Rob and Martin Thompson,2007]

**WATCH**

**Top part**

**Materials**

The top part manufactured in austenitic stainless steel, which is strong and non-magnetic. The main reason for choosing this material was because it's high corrosion resistance and are often used in typical watch cases.

**Manufacturing**

The part is made by milling which is one of the most versatile machining processes and is often used to make parts for watches.

**Outer shell**

**Material**

It was decided that the bottom shell should be manufactured in a plastic material because it's important the antenna isn't enclosed in a conductive material like metal which can weaken the signal. Therefore, ABS and PVC were considered where ABS were chosen. ABS is a strong material with high impact and abrasion resistance, low water absorption, are dimensional stabile and have a relative low price. These were the main reasons for choosing this material, as it should be able to take part in a physical violent situation without breaking. Furthermore ABS also have many possibilities in term of surface finishing.

**Manufacturing**

The bottom shell is injection molded with a two-part split mold and the part is molded from the inside of the shell so the injections marks are hidden when the watch is assembled. Injection molding have high tolls cost, but at a low unit cost and a very high surface finish.

**The Glass part**

**Material**

For the transparent screen plate soda-lime glass (most common type of glass) and high performance glass was considered. In choosing the material it was taken into consideration the product can be involved in some physical violent episodes and must be suited for that. So, to make

sure glass was a suitable material there was made drop test with existing watches where the glass didn't break. Even though the glass didn't break high performance glass was chosen because it has superior resistance to terminal shock, but it's also have higher cost because it's relative difficult to fabricate.

**Manufacturing**

To cut the glass screen plate water jet cutting and glass scoring was considered. Glass scoring was chosen because the process has lower unit cost and a rapid cycle time. The method also provide a good quality cut edge, but with some lateral cracking so the edge also needs polishing.

**The buttons**

**Material & Manufacturing**

The buttons is manufactured by compression molding which have moderate tooling cost and low unit price and can provide high strength parts with high quality surface finish. There will be placed many cavities with one mold. The parts are molded in silicone.

**RING**

**Inset**

**Material & manufacturing**

The inner shell in the ring is also made in ABS, mainly because it's strong and have high impact resistance and the relative low price. The small part will also be injection molded because it creates a lot of freedom according to the shape. The part will later be filled with silicone to fix the parts.

**Outer shell**

**Material**

Here both rubber and silicone considered. Silicone resins are often resistance to water, chemicals, heat and have good lubricate properties which are a benefit because the inner components have to be pushed into a pocket within the outer ring part. Silicone is a material with low strength but is very versatile and elastic.

**Manufacturing**

The part is manufactured by injection molding and the product have a total of four ring sizes. They are molded using one tool with four cavities, one for each ring. The mold is a two part splitted mold even though the part have an internal rum molded into it. This is made possible of silicon's flexible nature which make it possible to force the part out of the mold.



ill. 101: Product



# TRUST MAPPING

**Objective**  
To provide the overview who and how much the victims trusts the actors. This is to create a base of who the service could be provided from.

Research showed that the victim trust to the different actors involved in their situation is differentiates.

**Helping Organizations and Women shelters**  
Helping Organizations and Women Shelters understand the victims situation and are mentally supportive for the victim. Therefore it's the only actor who the victim feel understood by. Therefore they trust them most.

**Social circle**  
The victims family and friends does in many cases not understand the victim and their situation. Therefore the victim doesn't feel that they can talk to their family and friends about their situation.

**Emergency and security centre**  
The emergency and security centre provides more safety for the victim. Either by providing alarms for home or personal safety or by taking emergency calls and send help to the emergency situation.

**Police**  
The victim often spend a lot of energy on reporting their case to the police without any result. Therefore they feel the police can't help them and doesn't understand their situation. This is why their trust to the police are lowest compared to the other actors.

**Conclusion**  
The investigation outlined that the victim trusts the helping Organizations, Women Shelters, Security and Emergency Centres more then the Police. To make the victim trust the solution more, it could be provided by those.



ill. 102: Trust mapping

**Trust:** The distance between the actors and the victim illustrates how much the victim trust them.

## 06 IMPLEMENT

A plan for how the solution can be implemented was further detailed.

# IMPLEMENTATION POSSIBILITIES

Related worksheets: 68

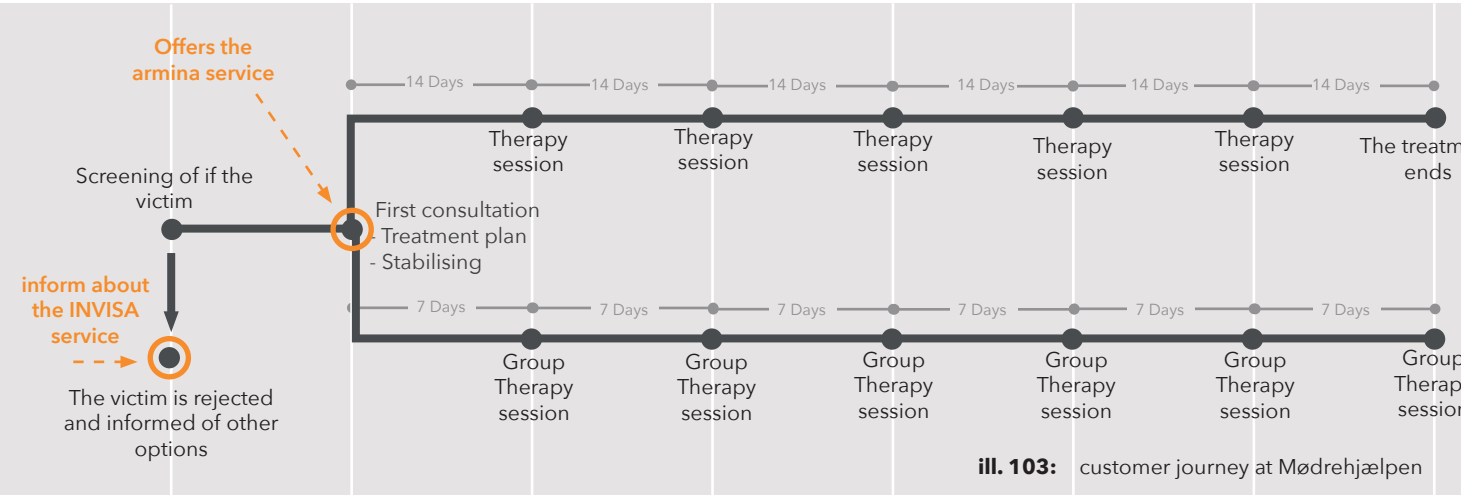
**Objective**  
To outline possible suppliers of INVISA, and which motivation the supplier could have according to supplied the service.

The investigation is preformed by looking at the different service the that the actors provide today and where INVISA could be implemented and which motivation it could create according to the actor.

## Helping organization (Mødrehjælpen)

By supplying INVISA the Help Organisations would be able to help the victims reach help in a quick and safe manner when being exposed to a critical assault situation and provide them with a solution which fit their needs. They also provide the victim with a tool they can use in the goal of re-establishing the control over their life. This extra help can reinforce the victims trust to organisation and make the organisation able to help the victim feeling more safe in their daily life where they can't reach within their service today. Looking at the

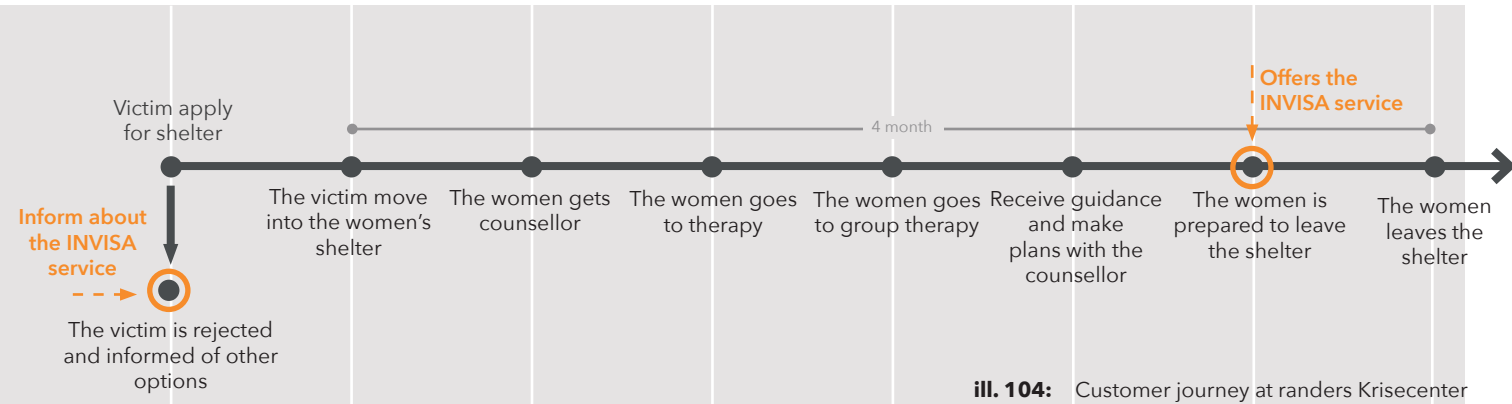
service Mødrehjælpen have today the victim go through a screening evaluation regarding if they fit the target group of the organisation. To create a considered parting with victim that are rejected the organisation could inform the victim of the possibility of getting a INVISA alarm. Furthermore "Mødrehjælpen" could also offer the alarm to the victim that are undergo ing the treatment in their organisation as a part of the first consultancy meeting.



## LOKK(Randers Krisecenter)

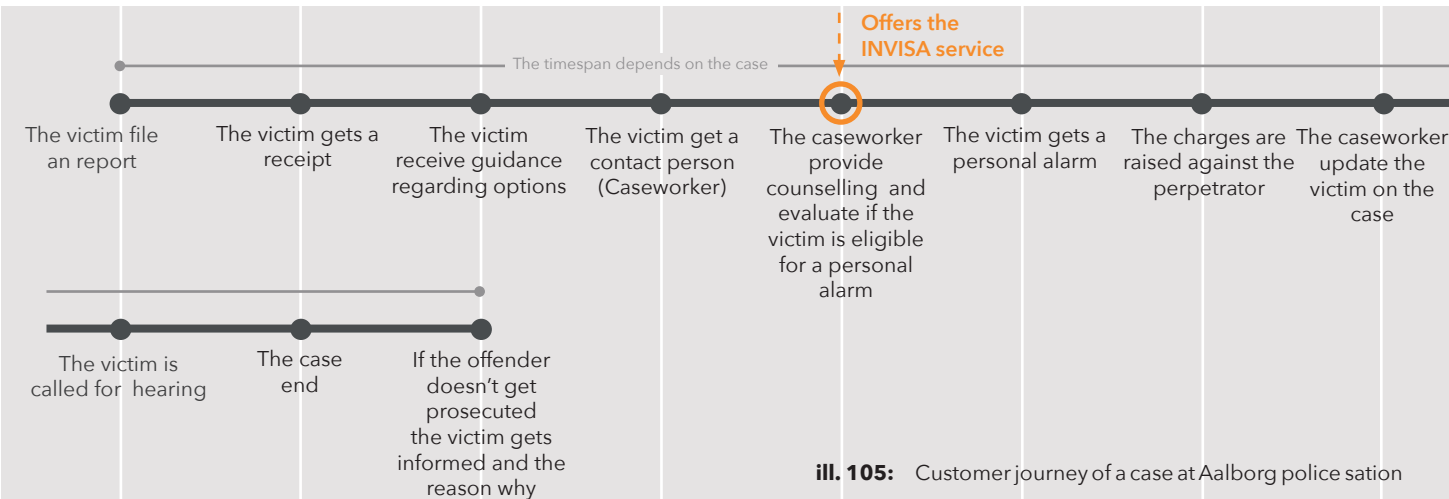
In LOKK and their included Women Shelters the INVISA service could also help the centres to create a better relationship to the 13.000 victims they have to reject each year because a lack of space at the facilities. This would make the victim feel more included and make them fell less alone.

The Women Shelter could also offer the alarm to residents at the centres that have to re-establish back into society, and could therefore offer the alarms to victims that need it to make a more flowing transition.



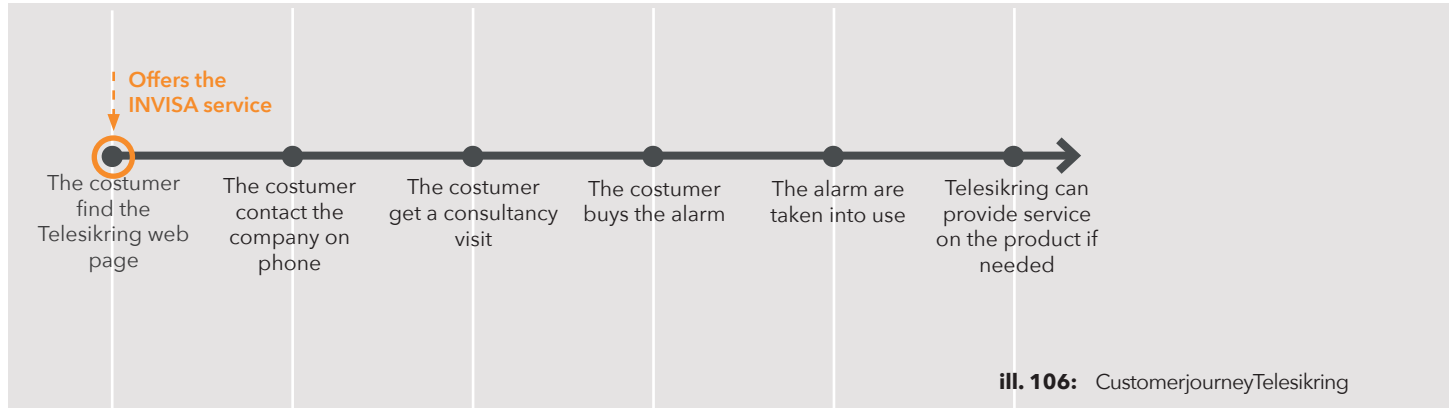
## Police(Aalborg Police station)

The Police Stations could provide INVISA as a part of their service in the same manner as they do today, but instead providing a solution that fit the victims need better and make them more safe in case of a assault situation and at the same time provide them with a solution that can help the victims collecting the evidence. With the INVISA service the Police will in some cases be able to arrive at the crime scenes quicker because of the new way of activating the alarm. Therefore the INVISA could help the police gain a greater trust from the victims.



## Security company (Telesikring)

With INVISA the security companies can expand their product portfolio and gain provide a more optimised solution to their customers.





# CUSTOMER JOURNEY MAP

Objective

To make a customer journey map that outline the different elements within the service and the different touch points the user go through when using the service.

The customer journey in ill. 107 shows touch points the user go through when be presented to the service through one of the help organisation and are based on their existing service.

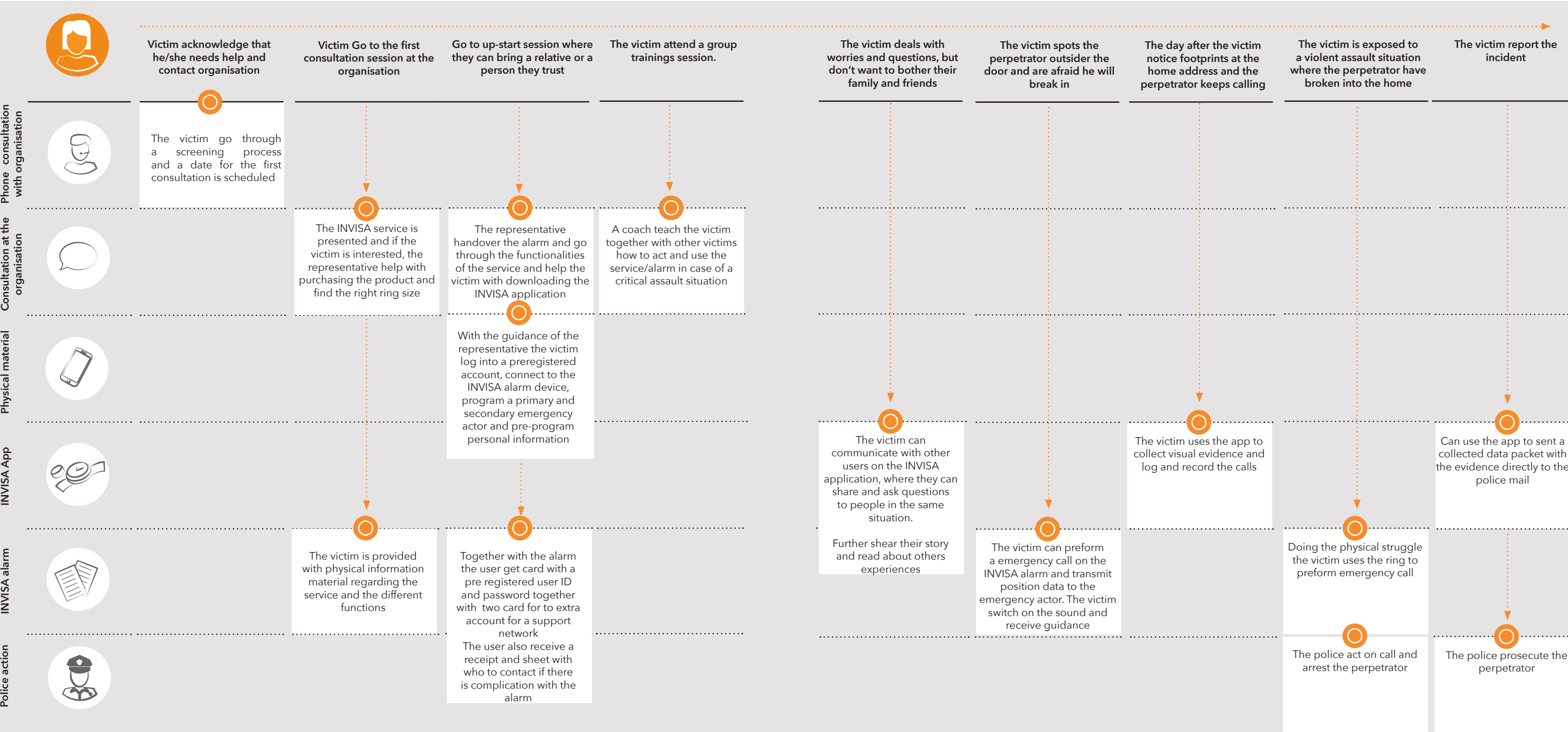
The service is similar if the users enters the service through some of the other channels but their are some differences. When being introduced to the service through the women's shelter they go through many of the same steps, but he women are presented to the service by the contact person they are assigned to when entering the shelter, and they will as well as at the help organisations receive coaching in how act and use the alarm in the emergency situation.

When being introduced to the service through either the police or the private security companies the users still receive an introduction to the service and receive guidance through the start up but the don't the receive the coaching sessions.

Conclusion

The customer journey created a overview the most important touch points in the service.

ill. 107: Customer Jurney



SERVICE BLUEPRINT

**Objective**  
To define and detail the different aspects of the service the solution should be a part of. And also the relation between the actors.

Firstly the user actions were defined and divided into pre-service, service and post-service.

The user actions is divided into three four sets which will be described in the following.

**Start up:** Where the user creates the account and set up the device.  
They can do it them self or get help from an helping actor to start up the device and account. The application safe the passwords and phone numbers so the victim shouldn't enter them every time they should use account.

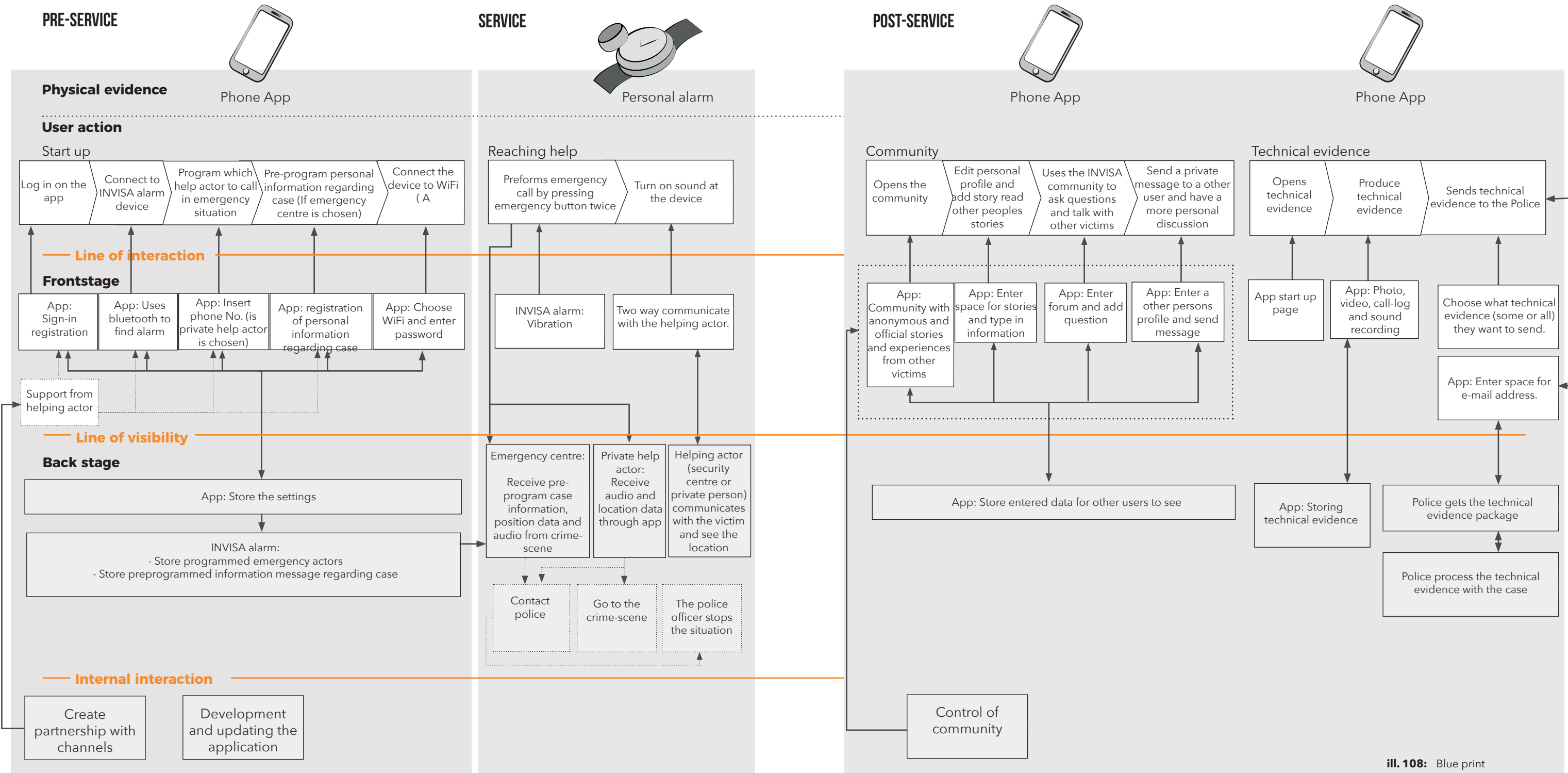
**Reaching help:** When the victim reach help it calls the helping actor. If the emergency centre is contacted the they will contact the police who

will provide help. If an other person is connected they can come to the place to see the situation and/or contact the police.

**Community:** The victim is a part of a community with other victims. To control that there aren't people in the community who shouldn't be there the provider should control it.

**Technical evidence:** The victim produce (and send) technical evidence for the police. The victim can choose to send all evidence or some of them to the police by entering an e-mail.

**Conclusion**  
The blueprint helped specifying wat happens front satge and back stage in the service.



ill. 108: Blue print



# MARKET, SALES AND PRODUCTION PRICE

**Objective**  
To estimate the marked target production and sales price three cases are investigated and evaluated.

**Market size**  
According to the statistic [Research on facts page 11] 100.000 - 132.000 people is exposed to stalking each year in Denmark. It's a number which is hard to estimate. If it's bet to sell INVISSA to 5% of stalking victims in Denmark, it will be 5.000 units.

Some components in INVISA are injection moulded which require mould costs. This means the higher number of unites we can sell, the cheaper the unit price will be. According to Dan Hill group around Injection moulding the optimal balance between units and price are when 100,000 units are produced [Industrial Design: Materials and Manufacturing Guide, s. 164].

3 cases were set up to calculate if it will be the risk worth to target a higher number.

In Sweden and Norway they haven't made trustworthy studies on stalking. Therefore this number is estimated from population in Norway, Sweden, Germany and Finland. 2% of Danish people are exposed to stalking. Therefore 2% of the population in the countries is calculated.

Country	Population [people]	2% [people exposed to stalking]
Norway	9,142,817	180,000
Sweden	4,712,355	95,000
Finland	5,289,128	100,000
Denmark	5,457,415	110,000
Germany	81,410,000	1,600,000
Total	106,011,715	1,628,200

Three scenarios are outlined below. Scenario 2 and 3 will require stabilisation of partners (helping organizations in these countries). INVISA uses universal systems which the other countries already use.

**Production price**  
The calculation of the production includes materials, tools, the manufacturing process and assembly. The tool cost will be divided in to the number of units in the 3 cases.

**Inner components**  
The total cost of inner components:  
Ring: 29DKK, Base unit: 343DKK.

**Total: 372DKK/unit**

**Tool cost**  
The tools for 4 injection moulds is estimated to:

**30,000DKK \* 4 moulds = 120,000DKK**

**Manufacturing cost**  
In the manufacturing processes include injection moulding, milling, sewing of straps and cutting. The electronics are complex and needs to be compact. The total manufacturing process is estimated to

**0.08h \* 120DKK/h = 9.6DKK/unit**  
**Upstart of machinery: 50,000DKK**

**Material**  
The material includes: leather, ABS (6.8g), silicone, steel and glass.

**30DKK/unit**

**Assembly**  
It's estimated that the product will take 25min to assembly.

**0.16h \* 120DKK/h = 6DKK/unit**

**Total manufacturing price**

This is the total estimated manufacturing price:

**Unit price: 460DKK**  
**Tool and upstart price: 170,000DKK**

**Sales price**  
The production price is multiplied with factor 4.

**Conclusion**  
There is uncertainty about the estimates on the basis of the product category. When looking in to the sale price it'sn't worth to take the risk of producing 24,000 or 100,000 units. Therefore it's started up by producing 5,000 units the first 2 years and then evaluate how big the demand will be. Over time it can be scaled to case 2, 3 and 4.

**Reflection**  
A huge part of the production part is the inner components. If the price should be lower it might be an idea to look possibilities for cheaper alternatives.

			Production price	Sales price	Investment	
<b>Case 1</b> Reaching 5% of the of victims in Denmark.  There is a risk the unit price will be more expensive.	<b>5,000 UNITS</b> Sold in 2 years for...	Denmark	493.6 DKK/unit	1,980 DKK/unit	2,468,010 DKK	<b>Chosen case</b>
<b>Case 2</b> Reaching 5% of the dumber of victims in Scandinavia.	<b>24,000 UNITS</b> Sold in 2 years for...	Denmark Sweden Norway Finland	466,7 DKK/unit	1,870 DKK/unit	11,200,410 DKK	
<b>Case 3</b> To keep the price as low as possible it's bet to sell 100,000 units to Scandinavia and Germany. There will be a high risk in terms of investment.	<b>100,000 UNITS</b> Sold in 2 years for...	Denmark Sweden Norway Germany Finland	461.3 DKK/unit	1,850 DKK/unit	46,130,010 DKK	
<b>Case 4</b> To keep the price as low as possible it's bet to sell 1,000,000 units to Scandinavia and Germany. There will be a high risk in terms of investment.	<b>1,000,000 UNITS</b> Sold in 2 years for...	Denmark Sweden Norway Germany Finland	459,7 DKK/unit	1,840 DKK/unit	459,770,010 DKK	

# BREAK EVEN

**Objective**  
To explore a plan of activities till the product launch and estimation of the payback time.

**Activities till product launch**  
Activities up to the launch can be seen at figure 110.  
Before the product can be launched there is a number of activities which needs to be preformed. It'sn't all of the tasks the team have competences to preform. Therefore experts will be included to the project. The involvement of experts are important to create the optimal experience with the product for the user.

- Internal**
- Establishing collaboration with partners
  - Developing marketing plan
  - Finding investors
  - Development of interface for application
- External**
- Product development with the focus on minimising the size, optimizing the construction, developing the software and hardware, development of application.

- Investment**  
The investment includes:
- Moulds for production
  - Prototypes

- Product developers
- Tests of the product performance
- Development of the application

This is estimated to be approxematly 3 mio.

**Operating cost**  
The operating cost includes:

- Manufacturing cost and materials for product: 2,300,000DKK
- Mortgage payment: 300,000DKK in 2 years

Total: 2,600,000DKK

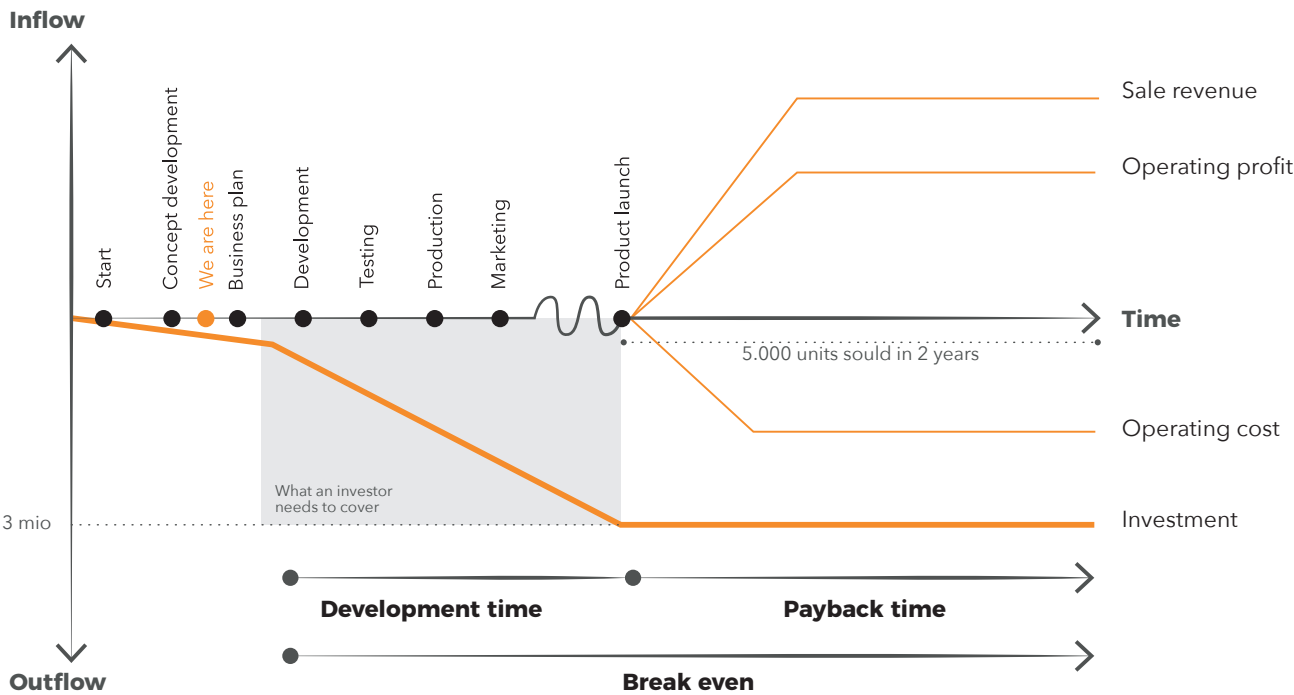
**Sales revenue**  
It's estimated to sell 5,000 units for 2,200DKK over 2 years.

Sale revenue: 11,000,000DKK in 2 years.

**Sales profit**  
Sales revenue - operating cost = 8,400,000DKK

**Break even**  
Investment / sales price = 1,363 units

**Conclusion**  
We need to be aware this investigation is based on estimates. Based on the estimations about 1,363 units needs to be sold to pay the investment back.



ill. 110: Realization of cash flow

# BUSINESS CASE

**Objective**  
To define in which ways the different product components is manufactured and the which material they should be produced in.

**Customer segment**  
Victim of stalking and mainly people who have been stalked by ex-partner or a person of close relation.

**Value proposition**  
INVISA provides victims of stalking with access to package solution that offer them extra help with ease some of the problems and worries they deal with in their everyday life according to violence and stalking they go through. More specific the value delivered to increase their feeling of safety by making the help more reachable in the emergency. Further also to make the victims understood less alone and minimize the feeling of being stigmatized, by introducing them to process and a community who have experience or are victim within the same problem area. Lastly also providing them with a tool which makes it easier to collect and organize evidence and get overview of which possibilities they have in their situation.

**Channels and the customer relationship**  
Because of the framing of the project and the look of the INVISA alarm it's important not promote the service through media, news outlets and social media to avoid being recognize by a possible perpetrator. Therefore the main channels within the service is predominantly the different help organizations that deals with issues related to violence and stalking, together with the women's shelters, LOKK and the police, which help the users with purchase the product a help them with complete the start-up and fill in the important information to make the process more comfortable and simple for the user. The product is purchased through a private wholesale security companies. The product is delivered to the location of the organization the user attend where it then is handed over. The security company provide maintenance on the products.

The users can also purchase the INVISA solution directly from the private security company if they aren't in contact with any organization. Her they will be able to find the service online on the homepage related to the company. But the homepage only show the outline of what the service provides and there will be no visual representation of the product, the user must then contact the company where they can arrange a meeting were the user can get more information on the service.

**Revenue stream**  
Victims of stalking spread over all social and economic classes which means some of the have a high amount of resource while others have a have low. The service can therefore both be purchased by asset sale but also through leasing where the purchaser e.g. can pay 185 DKK. Every month for a year. If the service is purchased through an organization the organization can offer a aid to lessen the money financial load. The percentages of the contribution will be arranged according to the individual organization and their capacity.

**Key partners and key activities**  
The key partners within this service is the police, the help organization and the shelters, which is a crucial factor creating awareness around the service and to establish a trusting and comfortable relationship to the users. Accordingly, one of the most important key activates is to establish partnerships with the different organization and private companies. Also, to further develop and test the product.



# REFLECTION

## Process

### Project management

Throughout the project a scrum board, physical calendar has been used for controlling the process. The calendar helped keeping the overview of deadlines and a visual representation of how much time were left to deadlines. From the beginning it was decided that the week should be started by defining the goal of the week, outlining what tasks needs to be done to reach the goal. The tasks were placed on a Scrum Board which provided a visual understanding of how many tasks were left to the goal and how many tasks we manage to perform through the week. It was a motivating factor.

For tracking how many hours were spent it was decided to type task and spent hours into an sheet. It wasn't the whole project period the team managed to do it. But in the period it were preformed it helped the team being aware of how much time was spent on each task.

### Involvement of users

Stalking is a topic victims are ashamed of talking about. Therefore it was hard to find victims who wanted to shear their stories. This have made it complicated through the concept and product development to make quick decisions. As the situation were impossible to set up it was hard to feel it on our own bodies. Therefore experts who is in contact with victims has been helpful to get a deeper understanding of the user group.

### Product detailing

The team were aware that the part of the project were lacking in competences were in developing the technology and construction of the product. It has therefore been decided to involve experts to the project. This helped making quick decisions on which components were needed to make the product work. By looking at existing solutions for construction the team quickly got knowledge about what was possible.

### Service development

The device has been rated as being the most critical part of the project. For being sure that the device would be detailed enough it has been the main focus through the concept development and detailing. Looking back at the project it might have been a good idea to develop the device and the service more integrated with each other. On the other hand it's hard for the team to see where we should find the needed time.

## Product

### Size of the devices

The product ended up being bigger than wanted. The size might be critical for making victims feel comfortable wearing the devices. For further work, experts in construction development and developing small technology solutions needs to be involved in the project.

### Construction

As the plastic shell is shaped today it's unsure if it can get out of the manufacturing mould. It's therefore needed to talk with an expert in developing plastic injection moulds and optimize the shell.

### Safe vs. exposed periods

Through the project it was decided the victim also should able to activate the emergency call on the watch to make them feel control of the device. There is a risk it will force them to use the device in a way that doesn't enable them to reach help quick and discreet. It might be a better solution only to locate the emergency activation on the ring so the victim is forced to wear the device in the way which makes them able to reach help quickly.

### Mistaken calls

It's not tested how easy it's to make a mistaken call. Tests of buttons in existing products has been tested which lead to the conclusion that it's possible to construct the ring which is hard to activate by accident. This need to be tested for further development.

# 07 SUMMARY

Sort description about what the chapter is about and what we did.

# CONCLUSION

From the beginning of this project it was clear that we couldn't shorten the timespan of stalking cases, but there was a potential to make victims take more control of their situation. Victims often feel alone, have troubles with handling their situation, doesn't have the opportunity to reach help in emergency situations and spend a lot of energy on collecting technical evidence.

INVISA provides a new way for victims to handle their own situation and has potential to reduce the victim's worries in their everyday life. The application provides a less energy consuming way of handling technical evidence, a collected overview of their helping opportunities and a community where they can build relations to other victims who understand their situation. The INVISA device enables victims to reach help in emergency situations without letting the perpetrator know. Therefore there is a lower risk of worsen situation and a higher chance that the victim gets the help they need.

INVISA is provided through actors who is involved in stalking cases today. These helps and supports victims by starting up the use of INVISA.



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