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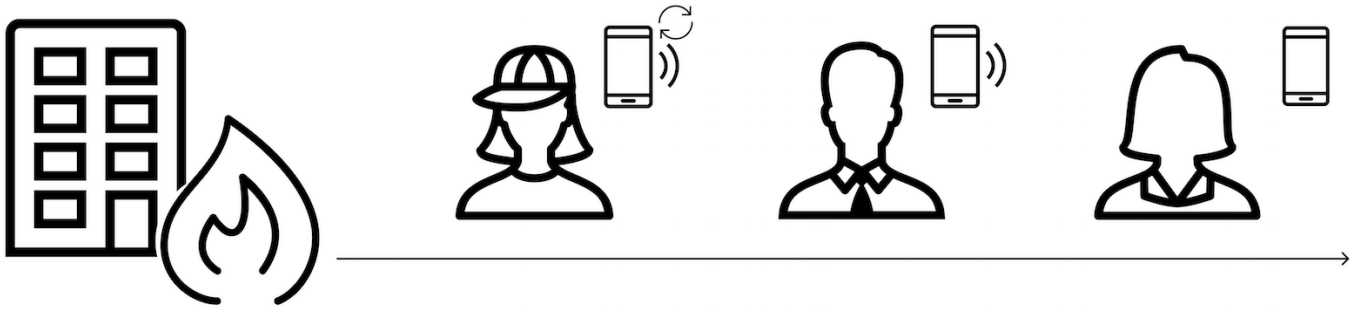

Hyperlocal Alert Messages –

Communicating Important Information to the Public in a Crisis

Master's thesis in Industrial Design Engineering

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Master of Science Thesis, Industrial Design Engineering

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Anna Skoglund & Kristina Videberger

Abstract

Public warning systems are meant for communicating important information to the public in a crisis, and the primary source for distributing important information to the Swedish public is through messages on the radio and through warning texts on the TV. The Swedish population can also receive warnings through SMS messages, and a network of sirens. This service, called Important Public Announcements (IPA), is owned by the Swedish Civil Contingencies Agency, and is operated by SR and SOS Alarm. These messages are usually issued 20 times per year, and the situations or crises that the message concerns have to pose a threat to life and property.

However, there are uncertainties amongst the authorities and individuals that have permission to issue such an announcements regarding what is severe enough to issue an IPA for. Another issue is the accessibility of information regarding the sirens. Approximately 50% of the Swedish population can hear the sirens when they are activated today. The sirens requires the population to know the meaning of the signal, and listen to the radio for more information. Another factor is that the media habits of the public have changed over the years, and radio and television are today not the main source for information. Therefore, this sets new demands for how information best reaches the population.

Through in-depth user studies and an investigation of the SOS organization, a service for how important and relevant information should be distributed in a digital form to the public is presented. The service includes a strategy and tactics on a conceptual level.

The service offers a concept for information messages to the public. It is called *Hyperlocal Alert Messages.* These messages are to be broadcasted to smartphones within 1-3 different zones, and at three different alert levels. The number of zones, their size and the alert level depends on the users' need of information and their required action inside each zone. The service should be managed by KBA, the Crisis Preparedness Coordinators at SOS Alarm. The service will use the information that the 112 operators collect from the people reporting a crisis through the emergency number, and provide KBA with decision support for a *Hyperlocal Alert Message*. The selected technology is Cell Broadcast, based on its ability to distribute messages to all smartphones inside an area without being affected by other data traffic.

The developed service has the potential to reach everyone using a smartphone, which is 80% of the Swedish population. The public will receive relevant information tailored based on their relation to a crisis. The service has the potential to standardize broadcasting of important information to the public in an effective manner. This service creates an opportunity to warn the public as soon as SOS Alarm receives information about a crisis which could potentially save more lives.

Definitions

112 operator	Receives calls from people that have seen or been subject to an accident or a crime. Follows an interview guide and asks questions accordingly and enters the details the caller answers to each question. The operator connects the right divisions, such as rescue-, medical or police services to the phone call.
KBA	Crisis Preparedness Center, also the operators working at the Crisis Preparedness Center is called KBA and/or KBA operator
MSB	Swedish Civil Contingencies Agency *(Swedish: Myndigheten för Säkerhet och Beredskap)*
Rescue Officer	The Rescue services' Commander-in-chief at the site of an accident
Rescue Dispatcher	Coordinates rescue services though listening in at the emergency calls 112 operators receives.
CoordCom	Software for the 112 operators interview guide. Classifies the situation based on the entered details. Different situations (such as rescue or medical) generates different interview guides and the classification is made through so called Temperature questions.

Abbreviations

CB	Cell Broadcast
IPA	Important Public Announcement
NL-Alert	The Public Warning System in the Netherlands
PWS	Public Warning System

Table of Contents

1. Introduction

In this chapter, the background to the project will be explained, both what the public warning system in Sweden was developed for, and how it works today. Furthermore, the aim of the thesis project and the process will be presented.

1.1. Background

Public warning systems are meant for communicating important information to the public in a crisis, such as a fire with toxic smoke, gas leaks or a contamination in the water. Sweden's warning system was tested for the first time in 1931[1] and consisted of a large network of sirens. The sirens, referred to as *Tyfoner or Hesa Fredrik*, are still in active use and are designed to loudly sound over larger areas to warn the public. Different tone intervals represent a different kind of threats to society[2]. Since 1931, complementing services for the public to be reached by Important Public Announcements have been introduced. Today, the official source for distributing warnings to the Swedish public is through messages on the radio. The Swedish population can also receive warning texts on terrestrial television channels and since 2017, warnings can as a compliment be sent as location- and address-based SMS-texts[3].

When the public warning system was implemented, Important Public Announcements (IPA) was deemed to be a national concern and an IPA is therefore broadcasted nationally on radio and TV. The media habits of the public have changed a lot over the years, and radio and television are today not the main source for information[4]. This is problematic because radio and TV are the primary sources for Important Public Announcements. This means that the public will only receive an IPA if they are actively listening to the radio or watching TV at the time of broadcasting an Important Public Announcement. The sirens can be activated locally and is reaching the part of the population who are within hearing distance. The Swedish Civil Contingencies Agency estimates that approximately only 50% of the Swedish population can hear the sirens when they are activated today[5]. It is required that the public knows what the different tone intervals mean (e.g. 7 seconds of sound, 14 seconds of silence for an IPA or a series of short signals sound for a duration of one minute if an Air Raid) to be able to understand what kind of danger they are in and what they should do (e.g. listen to the radio if it is an IPA or find shelter if Air Raid). However, this appears not to

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[1] Lars Olsson and Håkan Marcusson, 'Msb.Se - Frågor Och Svar' (*Msb.se*, 2018) <https://www.msb.se/sv/Insats--beredskap/Hantera-olyckor--kriser/VMA/Fragor-och-svar/> accessed 18 December 2018.

[2] 'Hesa Fredrik' (*Försvarsmakten*, 2018) <https://www.forsvarsmakten.se/sv/information-och-fakta/var-historia/artiklar/hesa-fredrik/> accessed 3 December 2018.

[3] 'SOS Alarm Om Viktigt Meddelande Via Sms' (*Krisinformation.se*, 2017) <https://www.krisinformation.se/nyheter/2017/juni/vma-sms-lag> accessed 3 December 2018.

[4] Myndigheten För Press, Radio Och Tv, 'Mediekonsumtion' <https://www.mprt.se/Documents/Publikationer/Medieutveckling/Mediekonsumtion/Mediekonsumtion-2017.pdf> accessed 25 October 2018.

[5] Lars Olsson and Håkan Marcusson, 'Msb.Se - Frågor Och Svar' (*Msb.se*, 2018) <https://www.msb.se/sv/Insats--beredskap/Hantera-olyckor--kriser/VMA/Fragor-och-svar/> accessed 18 December 2018.

be common knowledge as the public search for additional information regarding what the signal means and what their required action is. SMS messages can also be sent out on a local area, reaching persons in the affected area. However, If SMS massages are sent to a large number of recipients it means that there is a large risk of congestion of the network which means that the distribution of information can take a lot of time, reaching the public too late. This is problematic if the message contains instructions dependent on the broadcasted sources, such as "*Listen to the radio for more information*". If the message on the radio has already been broadcasted or is not available when the user receives instructions, the message is useless and causes unnecessary confusion

1.2. Aim

The aim of this thesis project is to design a service for distributing important information in a digital form to the general public. To achieve this, the project has aimed to fulfil the following objectives:

- Understand **what** the public perceives as relevant and important information;
- Study **how** the general public want, and are most likely, to be reached by relevant information;
- Investigate at what distance from a situation a person still finds information about the situation as important
- Design a strategy and provide guidelines for the design of the service.

1.3. Demarcations

This project focuses on creating a service with a frontstage and a backstage, possible to implement. The concept will include a strategy and tactics for the developed service. This thesis project focuses on how the public receives the information and to what extent the public should receive information about a crisis. Focus will not be placed on the content and phrasing of the message sent out to the public. In-depth details of the concept on an operational level for both the frontstage and the backstage is not included in the scope, due to the time frame of this project.

This project aims to look outside of the traditional boundaries of what is considered to be included in the concept of important information to the public. However, not all possible crisis and situations will be investigated due to the time frame of this project.

1.4. Project Process

The project process has involved four different parts: Research, Solution Space & Ideation, The Service, and Evaluation.

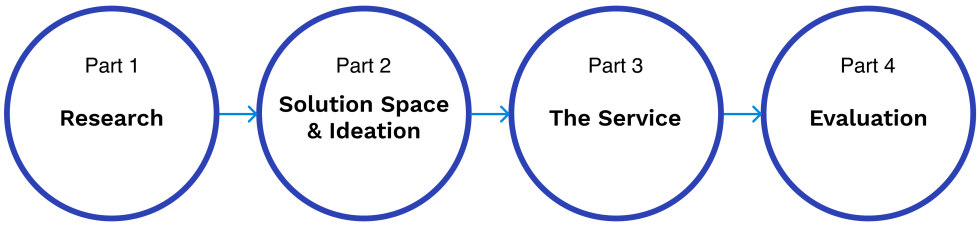

Figure 1.1 displaying the project process

The first part described the investigation and discovering of user requirements, public warning systems, and what possible technologies a solution could make use of.

The second part contained the solution space, where the user requirements and technical requirements framed the possibilities for what strategy to continue with. This part also contained ideation, concept development, and evaluation, as well as investigation of the implementation of the concept into SOS Alarm's organization.

The third part concerned defining the service. The service for the end users, the public, is called the frontstage. How the frontstage should be implemented and managed by SOS Alarm is called the backstage.

The forth part is an evaluation and discussion of the project.

1.5. Report Structure

The report is organized according to the same overall structure. Each of the parts in the report can be read separately, i.e. the research, the solution space, the service or the evaluation. Each chapter inside a part contains an aim, process, results and an evaluation. The chapters containing methods will provide an explanation of the method chosen, both the aim and the process, as well as the results and evaluation of said method. This to allow each chapter and method to be read seperately while still acquiring a full understanding of how each method affected the project. Each part contains a conslusion of the phase, to highlight the main take aways.

Part 1: Identification of Requirements

Part 1 of the report focuses on identifying requirements for a new PWS service. It includes a literature review, a benchmark investigation and interviews with different stakeholders and operators at SOS Alarm. Furthermore, it presents the user research. The user research consists of a pilot user research, a user study, a workshop, a survey, and interviews with 112 operators at SOS Alarm.

2. Researching Public Warning Systems

This chapter serves as a basis for the work that follows. In this chapter, the PWS research is presented. The research was done by harvesting knowledge from experts in the field, a literature review, and through benchmarking solutions implemented in other countries for digital Public Warning Systems.

2.1. Aim

Research regarding PWS was conducted with the aim to understand what limitations and opportunities there are for a digital solution. Furthermore, the aim was also to understand how other countries' PWS work, and how these PWS are managed.

2.2. Literature Review

A literature review is a method for surveying, analyzing and presenting previous research within the selected field of study[6]. This section provides an overview of what has been studied in the field of Public Warning Systems on a national (i.e. Sweden) as well as on an international level, as well as the media habits of the Swedish population.

2.2.1. Aim

The aim of the literature study was to investigate what types of PWS that exist, what solutions have been evaluated previously and the current state of the PWS in Sweden. The media habits of the population in Sweden were also investigated in order to understand in what ways people consume media, what sources people use to read the news and receive information about situations, crises and current events in the society.

2.2.2. Process

The literature study was an ongoing process, conducted throughout the project. The reports on PWS were found through SOS Alarm and the Swedish Civil Contingencies Agency (referred to as MSB), official web pages and through e-mails from officials at MSB. Information on media consumption habits were found through searching online for references on patterns of information consumption.

2.2.3. Outcome

The outcome is presented in three categories; *Swedish Public Warning System Evaluations, Public Warning Systems in Other Countries,* and *Citizens' Media habits*.

2.2.3.1. The Public Warning System in Sweden

In Sweden, the Public Warning System, hereon referred to as PWS, is managed by three entities:

- Swedish Civil Contingencies Agency *(Swedish: Myndigheten för samhällsskydd och beredskap, MSB)* responsible for the PWS;

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[6] 'What Is A Literature Review?' (*The Royal Literary Fund*, 2018) <https://www.rlf.org.uk/resources/what-is-a-literature-review/> accessed 14 October 2018

- SOS Alarm, the company managing the operative part of the emergency system, and also the PWS; and
- Public Services, such as Radio of Sweden (SR) and terrestrial television (SVT, TV4), who broadcasts the emergency message to the public.

The public warning system consists of four main channels to distribute information. These four are the following:

- Signalling Horns *(Swedish: Tyfoner, tutor, Hesa Fredrik);*
- Radio;
- Terrestrial television;
- SMS-, location- and/or address-based

Two different types of messages can be distributed:

- **Authority Message *(Swedish: Myndighetsmeddelande).*** *The radio and television law gives every authority the right to broadcast Important Public Announcements through SR, SVT, and TV4. Local radio stations also offer authorities to distribute messages, which are considered to be important for the general public, through their channels. The authority is responsible for the message, while the radio can make sure it fits within their broadcasting and does not influence their operations negatively*[7]*.*

- **Important Public Announcement *(Swedish: Viktigt meddelande till Allmänheten (VMA).*** *Important Public Announcement, hereon referred to as IPA, exists to distribute information to the public quickly in times of need. The IPA is supposed to complement the radio and television law. IPA is intended to be used to prevent and limit damages on humans, property, and environment.*

There are two levels of Important Public Announcements:

- Warning messages *(Swedish: Varningsmeddelande)*
- Information message *(Swedish: Informationsmeddelande)*

These two levels appear the same to the general public, the difference is instead how they are distributed. Warning messages are meant to be distributed immediately and to be limited to when there is an immediate risk for life, property or environment. An information message does not need to be broadcasted immediately but can postponed until there is an opening in what is currently broadcasted on the radio and TV.[8]

2.2.3.2. Evaluation of the Swedish Public Warning System

It is more difficult to raise the alert level than tone it down, according to Krantz at SOS Alarm. Therefore it would be better if a situation would be treated as more severe, rather

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[7] Morge S, *Alarmera, Informera : Varnings- Och Informationssystem I Fyra Länder*(Styrelsen för psykologiskt försvar 2010) <https://www.msb.se/Upload/Produkter_tjanster/Publikationer/KBM/Alarmera%20Informera.pdf> accessed 5 October 2018

[8] Morge S, *Alarmera, Informera : Varnings- Och Informationssystem I Fyra Länder*(Styrelsen för psykologiskt försvar 2010) <https://www.msb.se/Upload/Produkter_tjanster/Publikationer/KBM/Alarmera%20Informera.pdf> accessed 5 October 2018

than the opposite.[9] In 2000, a message of the highest alert level of IPA, a warning message (*Swedish: VMA, Varningsmeddelande)*, has never been demanded. According to Swedish Radio production lead *(Swedish: Sveriges Radios sändningsledning)*, so far all the messages categorized as an IPA have all been information messages.

The fact that the highest level had never been demanded is, according to Morge (2010), confusion between the different types of messages: An authority message and an IPA (including the two levels: warning message and information message). There is also confusion regarding knowing what type of message to use when, and how to call for one. Often, authority messages are entirely forgotten. Municipalities know they have the right to broadcast messages to the public and confuse their right to broadcast an authority message with an IPA. Hence, the reason the system is not always working as planned is due to a lack of knowledge of the different types of messages, and how to use them.[10] SOS Alarm, therefore, argues there is a need to increase knowledge about how the PWS is supposed to be used.[11]

There is a reluctance to use outdoor sirens, as this usually leads to unnecessary calls to SOS Alarm's emergency number 112. This indicates the lack of knowledge regarding the PWS. SOS Alarm is investigating how the general public could be more informed about the warning systems[12]. IPA is usually issued approximately 20 times per year taking into account all municipalities in Sweden. Out of these 20 alerts, one situation can be considered severe enough to use the outdoor sirens.[13]

SOS Alarm states that many use the emergency number 112 instead of 113 13, hoping to attain information as to why the sirens are sounding. This is probably due to a lack of awareness of the number 113 13 which is the information number that the public can call and receive information. Misuse of the 112 number leads to a blockage of the number for reporting emergencies, which is a less beneficial situation for people in crisis and for SOS Alarm.[14]

Hedström at MSB argues that it is of importance to create a system that is appropriate for all types of situations and that uses modern technology. A new system should be more effective, both in terms of the technology possibilities and administrative, than the current

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[9] Morge S, *Alarmera, Informera : Varnings- Och Informationssystem I Fyra Länder*(Styrelsen för psykologiskt försvar 2010) <https://www.msb.se/Upload/Produkter_tjanster/Publikationer/KBM/Alarmera%20Informera.pdf> accessed 5 October 2018

[10] Morge S, *Alarmera, Informera : Varnings- Och Informationssystem I Fyra Länder*(Styrelsen för psykologiskt försvar 2010) <https://www.msb.se/Upload/Produkter_tjanster/Publikationer/KBM/Alarmera%20Informera.pdf> accessed 5 October 2018

[11] SOS Alarm (2017). *VERKSAMHETSRAPPORT 2017*. [online] Available at: <https://www.sosalarm.se/contentassets/f789d6730fcc474296610827498718a2/112_rapporten_2017.pdf.>

[12] SOS Alarm (2017). *VERKSAMHETSRAPPORT 2017*. [online] Available at: <https://www.sosalarm.se/contentassets/f789d6730fcc474296610827498718a2/112_rapporten_2017.pdf.>

[13] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

[14] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

one.[15] Implementing an additional system to the current system would increase the ability to reach the public in Sweden substantially.[16]

Cell broadcast (from hereon referred to as CB) is a technology which broadcasts information from one source to many recipients. This technology can send messages to a specific area, without knowledge on who or how many there is within the area. Cell broadcast reserves a channel in the network so the messages can always be broadcasted. This technology is what MSB suggests Sweden should use, as it is in line with the initiative EU-Alert Standard. EU-alert standard is a standard for how to send out warning messages and what functionality it needs.[17]

2.2.3.3. Public Warning Systems in Other Countries

An analysis of the PWS trends in the world shows that many countries are investigating new systems to add to or to replace their current ones. Often these new systems are based on using receivers which the public already has, such as mobile phones and through internet access. According to MSB, in all studies that they encountered, the preferred technology for mobile phones (when comparing SMS and CB) is CB as this is the most suitable technology.[18] This statement is further supported by a report from Canada, published in 2018[19].

In Canada, each province is responsible for their own alert system. At first, there was a fear of misuse of the system. Therefore, the initial usage of the system was explained as to be used for “doom day situations”. However, this resulted in a fear of using the system, even when it should have been used. The system is now encouraged to be used too often, rather than too seldom, as it is difficult to know beforehand if the system should be used or not. Canada has come to the conclusion that it is better to warn than not to. Herb Presley in Canada says “Warning systems main function is not to be used when the crisis is happening, but when one believes there is a potential risk, that is when you could save lives.” *(Translated from Swedish: ”Varningssystem är inte i första hand till för när krisen redan är ett faktum, utan för när man tror att något allvarligt är på väg att hända, det är då man kan rädda liv.”)*.[20]

The UK evaluated the possibility of implementing a mobile phone alert system, and 85% of their population thought it was a good idea. This study came to the conclusion that the preferred technology was to use location-based SMS. The reasons behind this result are

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[15] SOS Alarm (2017). *VERKSAMHETSRAPPORT 2017*. [online] Available at: <https://www.sosalarm.se/contentassets/f789d6730fcc474296610827498718a2/112_rapporten_2017.pdf.>

[16] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag ”Strategisk Inriktning VMA Och Varningssystem”* (Myndigheten för Samhällsskydd och Beredskap 2012).

[17] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag ”Strategisk Inriktning VMA Och Varningssystem”* (Myndigheten för Samhällsskydd och Beredskap 2012).

[18] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag ”Strategisk Inriktning VMA Och Varningssystem”* (Myndigheten för Samhällsskydd och Beredskap 2012).

[19] *Public Alerting Environmental Scan* (Alberta Emergency Management Agency 2018)

[20] Morge S, *Alarmera, Informera : Varnings- Och Informationssystem I Fyra Länder*(Styrelsen för psykologiskt försvar 2010) <https://www.msb.se/Upload/Produkter_tjanster/Publikationer/KBM/Alarmera%20Informera.pdf> accessed 5 October 2018

that SMS could use existing infrastructure, which offers better value for money, and CB needed at the time of the study to be activated on each handset.[21]

The Netherlands was the first country in Europe to send warning messages through cell phones to the general public. The project was initiated in 2004, and CB was selected for the project in 2008.[22] (More information about the Dutch system, NL-Alert, can be found in chapter 4.1.)

Finland investigated the possibility of implementing warnings through SMS during 2010 and 2011. The cost was however deemed too high, leading to the cancellation of the project. However, a new investigation will commence that will look into other options than SMS.[23]

Norway is investigating if their sirens could be replaced by information via mobile phones instead. If Norway would choose to continue with warnings through the phones, the technology would be CB.[24] The government in Belgium decided in 2011 that a warning system for mobile phones using CB should be implemented[25]. This was launched in 2017[26]. Chile uses CB to send information mobile phones as a part of their PWS[27].

2.2.3.4. Citizens' Media habits

This part is based on the report called 'Media consumption', which was published in 2017. The statistics originate from Sweden in 2016.[28]

The report concludes that digitalization has created a difference in the media consumption between the younger and older generations. The traditional media is used to a larger extent by the older generation, while the digital media is used by the younger. On average, a person in Sweden consumes 340 minutes of media each day. Out of the 340 minutes, 199 minutes (59%) are spent on traditional media (such as tv, radio, and paper newspapers), 55 minutes on digital media (online versions of traditional media), 46 minutes on social media

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[21] *Mobile Alerting Trials: Project Report* (Cabinet Office 2014). <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/298687/Mobile_Alerting_Trials_Project_Report_FINAL.pdf> accessed 4 October 2018

[22] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

[23] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

[24] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

[25] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

[26]Petros Kremonas, 'Belgium Launches Public Warning System To Alert Population In Case Of Crisis – EENA' (Eena.org, 2017) <https://eena.org/be-alert-public-warning/> accessed 20 January 2019.

[27] Lars Olsson and Håkan Marcusson, *Faktabilaga UB-Uppdrag "Strategisk Inriktning VMA Och Varningssystem"* (Myndigheten för Samhällsskydd och Beredskap 2012).

[28] Myndigheten För Press, Radio Och Tv, 'Mediekonsumtion' <https://www.mprt.se/Documents/Publikationer/Medieutveckling/Mediekonsumtion/Mediekonsumtion-2017.pdf> [accessed 25 October 2018.]

and 40 minutes on music. However, this differs significantly between different ages. The age span of 15 to 24-year-olds consumes significantly more media than the rest of the population. Furthermore, they spend less time on traditional, and more on Internet-based media. This age span consumes approximately 99 minutes (22%) of traditional non-digital media, and the remaining time on digital media. For the age span older than 65 years of age, 93% of their media consumption is spent on traditional media. Overall, the youths' consumption pattern is increasing with the rest of the population, indicating a move towards digital media.

Eighty percent of the population in Sweden has access to a smartphone, and 90% of the population under the age of 45 uses the internet from their phone every day. Social media is a big part of the media consumption for the younger generation; 94% of the time for the age span between 9-14 years of age. This is significantly less for the age span between 65-79 years of age, as they spend 31% of their total media consumption on social media.

Eighty-three percent of the 15 to 24-year-olds uses streaming services, like Spotify, for their consumption of music, while the corresponding number is 8% for the age span 65-79 years of age. Among the younger segment, there is a large part not using any source for news and almost half of the population between 15-24 years of age access news through Facebook.

There is also a large gap between the generations in consumption habits when it comes to radio. The 60 to 79-year-olds listen on average 176 minutes per day, while the 12-29 years of age only listen 56 minutes per day. SR is reaching approximately 58% of the population, and the most popular radio channel is P4 (local radio). SR is typically listened to at home, 60% of the time.

The trend for television habits shows that the older generation spends an increasing amount of time watching television, and the opposite applies to the younger generations. On an average day 64% of the entire population is watching TV, and in general, this trend is decreasing. This is not only due to less TV-watching but also to the fact that fewer people have access to a TV. SVT1 and TV4 are the channels with the highest reach. For the younger segment, the time distribution between regular TV and streaming services are almost equal, while the older segment only uses regular TV.[29]

2.2.4. Implications

The studied material originates from stakeholders that work with a PWS in each studied country, either as an owner or as a provider of the service. The material studied might therefore contain some bias, as it is apparent that one technology is favored. However, they are also experts within this field with extensive knowledge, therefore a certain bias can be justifiable. MSB argues that, in 2012, all countries that investigated different options for PWS came to the conclusion that CB would be most beneficial. This was the same outcome for the Alberta study in 2018. Two years after the MSB study, the UK came to the conclusion that location-based SMS is the preferred solution as the value for money is greater than investing in a CB solution.

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[29] Myndigheten För Press, Radio Och Tv, 'Mediekonsumtion' <https://www.mprt.se/Documents/Publikationer/Medieutveckling/Mediekonsumtion/Mediekonsumtion-2017.pdf> [accessed 25 October 2018.]

The statistics show that SOS Alarm receives unnecessary calls as the public appears to think of SOS as the source for information. This cannot be considered very surprising, as SOS does have the information. However, SOS cannot communicate this information through the emergency number. It is not how the usage of this department is intended to work, and communicating through this channel would most likely create an untenable situation for the 112 Emergency Department. It could, however, be beneficial to use this unique position that SOS has to send out information to the public, with the aim to reduce calls. A warning system through cell phones could be beneficial to use, similar as to how Canada intends to use their PWS when there is a potential risk of danger to parts of the population.

The most digital generation, the younger generation, appears to be the hardest to reach through public service and traditional media. The media usage pattern shows that an increasing percentage of the population uses more digital services and less traditional media. As IPA and Authority Messages are broadcasted on the local radio SR P4 and on TV-channels such as SVT, and TV4. This results in that people will receive important information if the situation is broadcasted during the time of watching tv or listening to the radio, which makes it more difficult to reach the younger generation. Also, since a majority of listening to SR is done at home (60%), it is less likely to reach persons on the move.

In addition, 80% of the Swedish population has a smartphone. This suggests that there is a great potential to reach a majority of the population, if a mobile PWS was to be implemented. Therefore, a decision was made to narrow down the scope and focus on developing a PWS for cell phones.

2.3. Benchmarking

A ‘benchmarking’ means to compare a product or service to other references to understand how it compares to other products or services on the market[30]. This section provides an overview of what products and services for public warning systems have been implemented in other countries.

2.3.1. Aim

The aim of the benchmarking study is to investigate what digital alternatives to PWS there are for cell phones.

2.3.2. Process

The literature review was used as a basis for the benchmarking process. As a compliment, online search engines were used. The search terms were for example *alert system, Important Public Announcements*, *public warning*, and similar keywords from the literature study.

2.3.3. Outcome

Apart from traditional solutions, such as radio and TV, the identified digital solutions for distributing Important Public Announcements are SMS services, Cell Broadcast, and

[30] 'What Is Benchmarking? - Definition From Techopedia' (*Techopedia.com*, 2018) <https://www.techopedia.com/definition/17053/benchmarking> accessed 5 October 2018

applications or ‘apps’. Australia uses a location-based SMS text message service which is similar to the Swedish initiative[31]. Countries using cell broadcast, e.g. USA[32], Canada[33], New Zealand[34], the Netherlands[35], Romania[36], and Japan[37].
South Korea [38,39], Finland[40], France[41], and Luxembourg[42], have developed applications to provide information and to push notifications to the public in case of an emergency. These applications can also contain other information that is deemed necessary for users in an emergency, such as to where to find shelter and call to the emergency services through the app.

SMS messages can be sent to users based on location but also based on the address where the phone number is registered. All phones that are, or have been, identified as ‘active’ by a tower that sends the message out will be targeted. All cell phones can receive a text message, and hence requires no activation from the users. An SMS can be sent to between 200-800 recipients per second depending on the mobile operator and the messages use the regular cellular network. The delivery time for all SMS messages is dependent on traffic load and capacity of the mobile operator. Every SMS message is sent from one source to one phone number over the mobile network, which makes the process

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[31] ‘Emergency Alert. Be Warned. Be Informed.' (*Emergencyalert.gov.au*, 2018) <http://www.emergencyalert.gov.au/> accessed 9 September 2018

[32] 'Emergency Alerts | Ready.Gov' (*Ready.gov*, 2018) <https://www.ready.gov/alerts> accessed 9 September 2018

[33] 'Alert Ready Emergency Alert System - Pelmorex Corp. - Alert Ready Emergency Alert System' (*Alert Ready Emergency Alert System - Pelmorex Corp.*, 2018) <https://www.alertready.ca/> accessed 8 September 2018

[34] 'Emergency Mobile Alert' (*Civildefence.govt.nz*, 2018) <https://www.civildefence.govt.nz/get-ready/civil-defence-emergency-management-alerts-and-warnings/emergency-mobile-alert/> accessed 9 September 2018

[35] 'NL-Alert | Crisis.Nl' (*Crisis.nl*, 2018) <https://crisis.nl/nl-alert> accessed 8 September 2018

[36] 'Despre RO-ALERT – RO-ALERT' (*Ro-alert.ro*, 2018) <https://ro-alert.ro/despre-ro-alert/#despre-tab-3> accessed 8 September 2018

[37] 'J-Alert: Disaster Warning Technology In Japan - Centre For Public Impact (CPI)' (*Centre for Public Impact (CPI)*, 2018) <https://www.centreforpublicimpact.org/case-study/disaster-technology-japan/> accessed 9 September 2018

[38] 'Emergency Ready App' (*Play.google.com*, 2018) <https://play.google.com/store/apps/details?id=kr.go.nema.disasteralert_eng&hl=en_U> accessed 8 October 2018

[39] '안전디딤돌' (*Play.google.com*, 2018) <https://play.google.com/store/apps/details?id=kr.go.nema.disasteralert_new&hl=en_US> accessed 9 October 2018

[40] 'Framtiden - 112 Hätäkeskuslaitos' (*112.fi*, 2018) <https://www.112.fi/sv/nodcentralsreformen/112suomi_programvara> accessed 8 September 2018

[41] Chrisafis A, 'France Launches Smartphone App To Alert People To Terror Attacks' (*the Guardian*, 2016) <https://www.theguardian.com/world/2016/jun/08/france-smartphone-app-alert-terror-attacks-saip> accessed 14 September 2018

[42] 'Gouvalert.Lu' (*Play.google.com*, 2018) <https://play.google.com/store/apps/details?id=lu.ctie.gouvalertlu> accessed 9 October 2018

of distributing an IPA slow and also susceptible to congestion. In a survey done by SOS Alarm in February 2018, 1030 people randomly selected people in Sweden were asked to state how they wished to receive an IPA. An SMS was stated the most favorable solution.[43]

CB technology is similar to radio broadcasting. A message is broadcasted inside an area, called 'cell', and cell phones within this cell can pick up the message. When a user receives a message, it appears automatically on the screen and looks similar to an SMS. It can also be programmed to notify the user with a distinctive tone, overriding the settings on the device. To close the message, the user has to actively take action and press an OK-button on the screen. Like regular radio broadcasts, the service is anonymous[44]. CB stands independent from traffic load and reaches all phones inside an area within seconds.

An application offers the possibility to provide users with more information and different kinds of information, e.g. images and maps. Potential users could choose what type of information they would like to receive. This is very different from SMS and CB, where the option to choose what information to receive is limited and the information is text-based. For senders to be able to provide information to users, the users are required to download the application to their smartphone and have an internet connection. Applications use the cellular network, which (like SMS) makes apps susceptible to congestion. This happened, for example in France during a terrorist attack in Nice, as users received the information hours after the attack[45].

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[43] 'Undersökning Om Kanalval För VMA – Viktigt Meddelande Till Allmänheten' (*Sosalarm.se*, 2018) <https://www.sosalarm.se/globalassets/dokument/pressdokument/sos-alarm--undersokning-om-kanalval-for-vma.pdf> accessed 27 September 2018

[44] 'How It Works - One2many.Eu' (*One2many.eu*, 2018) <https://www.one2many.eu/en/cell-broadcast/how-it-works> accessed 5 October 2018

[45] Chrisafis A, 'France's Saip Emergency Smartphone App Failed During Nice Attack' (*the Guardian*, 2016) <https://www.theguardian.com/world/2016/jul/16/nice-terroist-attack-france-saip-emergency-smartphone-app-failed> accessed 14 September 2018

Table 2.1 displaying a comparison of the three different Public warning system technologies.

Comparison of Technology			
Specification	SMS	CB	App
Transmission type	Point-to-one	Point-to-area	Point-to-one
Information about user	Phone number and location for location based SMS Phone number and address for address based SMS	None	Location
Location based information	If position is known	If user is within stated broadcast area	If position is known
Communication direction	Two-way	One-way	Two-way
Data transfer	Sent over mobile network	Dedicated channel	Sent over mobile network
Susceptible to congestion	Yes (due to data transfer method)	No (due to data transfer method)	Yes (due to data transfer method)
Security	Low	High	High, if penetration tests have been passed
Possibility to receive message	Possible as soon as phone is on	Always by default in most smartphones, unless users have opted out from messages	When connected to the internet
Repetition rate	No repetition	Can be repeated, from 2 seconds to every 32 minutes	Could be implemented
Language selection	Could send a different message to foreign phone numbers and one to Swedish numbers	Possible to broadcast messages in recipients preferred language	Could be implemented
Message storage	Yes	Dependent on phone vendor (handset)	Could be implemented
Delivery confirmation	Yes, number of recipients and status can be seen	No, no information about number of recipients or status	Could be implemented
Service Barring	No barring	Possible to opt out from some levels	User can choose to not download app
Message length	140-160 characters, longer messages supported	1395 characters (15 pages x 82 octets)	No limit
Possibility to include links/multimedia	Possible to provide links	Possible to provide links	Possible to include multimedia and links

2.3.4. Implications

The existing SMS service is a fully implemented service in Sweden today, and according to the survey conducted by SOS Alarm this is also the preferred solution by the Swedish population. However, what has to be taken into consideration is why this was considered the best option for the participants in the study. Messages can be distributed to all phones inside an area or the address where the number is registered, and the users do not have to do anything in order to receive a message such as downloading an ‘app’. The solution is, however, very vulnerable when the traffic load is high. The same applies to applications. In terms of an app solution, more demands are set on users as they have to actively find and

download it. Both SMS and CB are more limited in what type of information that can be distributed to recipients in comparison with an app. Thus, CB appears to be the most favorable option after the benchmarking phase. It reaches all recipients faster than SMS and does not require any action from the user, as an application does.

2.4. Interviews with Stakeholders at SOS Alarm

This section presents the process of, and the results from, developing insights into the IPA-chain from SOS Alarm's perspective.

2.4.1. Aim

The aim of the study was to understand what role SOS Alarm has in the IPA-chain, how the IPA-service works on an operative level, and to get the organization's perspective on what strengths and weaknesses there are with the existing PWS.

2.4.2. Process

Information was collected by means of personal interviews. The interviews were open, with the aim to let each stakeholder discuss and describe their view on the IPA-service. The interviews were recorded and digital notes were taken during interviews. Each interview was held with a focus on one specific service at SOS Alarm, and each interview lasted for approximately one hour. Four interviews were conducted, with participants according to the following list:

1) Interview with the Head of Crisis Preparedness;
2) Interview with three Service Developers;
3) Interview with two Service Owners for the 112 and the Crisis Preparedness;
4) Interview with the Service Owner for the Rescue Services.

2.4.3. Outcome

From the interviews, two main areas of interest were identified; *the Digital Alert Message System Today* and a *Need for More Targeted Information.*

2.4.3.1. Digital Alert Message System Today

In a report published in 2011 by the Swedish Defence Materiel Administration *(Swedish: Försvarets Materielverk FMV)*, SMS was recommended as the most suitable option for a PWS to cell phones. The SMS solution was considered to be the most appropriate as everyone with a cell phone can receive a message, without having to perform an action to receive the information. The negative aspect was that sending a large number of text messages to an area can cause congestion to the network. This means that it can take hours to distribute information to everyone. Cell Broadcast was mentioned as a researched alternative but was regarded as less beneficial due to the fact that (at the time) the population had to configure their phones to receive a message, that the Dutch PWS system (using CB) did not reach more than 50% of their population, and that people could opt-out from receiving messages.

2.4.3.2. The Need for More Targeted Information

During interviews with service owner for the rescue services, it was stated that during a fire it is desirable to distribute information to residents in houses and apartment complexes

based on their required action (e.g. evacuate or stay inside). Further, it would be desirable to provide them with information about the current status of the rescue. It was explained by this example: "*An apartment complex is on fire. The smoke can potentially be dangerous for residents nearby. SOS Alarm distributes an SMS with instructions saying that everyone in the area should close the doors and stay indoors to avoid the smoke*." The particular SMS is obviously intended for everyone in the area who are not inside the burning building. It was stated that the rescue services at the site can communicate with people inside the building by using the phonebook and call everyone listed in the building or by knocking at windows to alert people of the danger. Therefore, for every minute that the rescue services cannot communicate with each person in the building then these persons risk being misled by the information in the SMS. It is therefore desirable to have the ability to target a more narrow audience with information. However, when SMS has been sent out, people who have not received one asks why they did not. Therefore, it is of importance to communicate information based on what action the public has to do but also to inform the public of a situation.

Another issue that was raised was that SOS Alarm cannot always distribute the information they have about a crisis, due to legislation. Legislation demands an authorized person at a site to requests an IPA. It was expressed during the interviews as problematic if it takes a long time for an authorized person to reach the place of an accident for instance. An example that was brought up was the incident with the bridge at Tjörn that collapsed in 1980. In this particular situation, it took 40 minutes before the police were at the site and could stop traffic. If a situation like that would occur today, SOS would like to have the possibility to inform the public before authorized personal is at the site. During several interviews, it was expressed that SOS would like to be able to distribute information at a faster pace in situations like this in order to save more lives.

2.4.4. Evaluation

The semi-structured interviews allowed for a more relaxed conversation and the ability to shift the focus to what each service owner/developer deemed as important for their specific service area. This led to a focus on areas relevant for them to discuss and highlight while complementing questions were asked. As the interview participants are experts within their respective areas it was deemed as beneficial to let them guide the course of the interview at this early stage. All stakeholders came to the conclusion that the existing system needed to be reconstructed, and that it is a complex system with both internal and external actors. Also, there appears to be a need for a change in legislation, to allow Important Public Announcements to be communicated to prevent risks for life and property.

An interesting aspect is a need for distributing more targeted information, and a wish to be able to distribute information at a faster pace. It might be a possibility to be able to issue an IPA before a rescue officer, or other authorized person, has arrived at the site of an accident. As it was also found that there are parts of the population that question as to why they have not received any information in the occurrence of a crisis. This can also indicate that there is a desire from the public to receive more information from authorities about situations that happen in society. This is also discussed in the literature review.

2.5. Study visit to Crisis Preparedness Department

In this section, a study visit to the Crisis Preparedness Department to meet with the Crisis Preparedness Coordinators (*Swedish: Krisberedskapssamordnare förkortat KBA)* (hereon referred to as KBA) is presented. KBA is responsible for surveilling what happens in Sweden and internationally and to be able to prepare SOS Alarm and other authorities for any crises that might happen. They are also responsible for coordinating the IPA. The KBA operators are the ones who receive IPA requests, communicate with SR, and send out an IPA via SMS if that is requested.

2.5.1. Aim

The aim of this study visit was to understand how an IPA request is handled from the point in time when KBA receives notice of an IPA until the IPA is sent out.

2.5.2. Process

One semi-structured interview was carried out with a KBA operator at the Crisis Preparedness Department in Stockholm. While answering questions regarding Important Public Announcements, the operator simultaneously demonstrated the software and the process that KBA operators perform when distributing an IPA. The visit lasted for approximately two hours. (The material used as a basis for the discussion can be found in Appendix I.)

2.5.3. Outcome

KBA has existed since 2009, as a result of an identified need to coordinate crises. Earlier, the 112 operators managed the important message services together with SR. KBA operators have a good overview of what current situations and crises that are currently ongoing and active in Sweden as they surveil the current state of all reported emergencies. This is visible to KBA operators through CoordCom, the computer system in which 112 operators collect all information from emergency calls.

When an IPA is demanded by a rescue officer, most often in case of a fire, KBA starts a conversation with SR about what to broadcast. Disputes about what content to write in the message might occur and cause delays in sending out information. However, this is not considered as a long delay according to KBA. It happens though that the message SR broadcast, and what SOS Alarm communicates through SMS differ. When KBA composes an SMS, the operator uses a word template as a basis. The template contains a number of precomposed messages, depending on what type of crisis it is. KBA selects the appropriate message, e.g. a fire with heavy smoke. The message is short and contains details of what and where a situation has occurred (e.g large fire in an apartment building), one action by user (e.g. close windows and doors) and who is recommending the action (e.g. a rescue officer). The operator selected the entire text from the template, copies it into the SMS software and add details such as what has happened, the affected area, date, time and which local radio station to listen to. However, occasionally SR is not satisfied with the message composition. Therefore, SR sometimes recomposes the message and broadcasts a different. This cause confusion when the public receives different information from two official distributors of IPA messages. The software used to send SMS messages is called UMS and stands independent from CoordCom.

2.5.4. Evaluation

KBA operators have a good overview of the current status of any crisis and situation in Sweden. As found during the interviews with stakeholders at SOS Alarm, the emergency chain is complex and contains many different internal and external stakeholders. From this meeting the consequences of this complex system became clear. The communication between different actors, SR and SOS, causes delays. Another factor is also that as information occasionally differs from SOS Alarm and SR, and this cause confusion amongst recipients.

2.6. Interview with the Swedish Civil Contingency Agency

This section presents the aim, process, and outcome from the interview performed with Lars Olsson and Håkan Marcusson from the Swedish Civil Contingency Agency, *(Swedish: Myndigheten för Samhällsskydd och Beredskap, förkortat MSB)* (hereon referred to as MSB).

2.6.1. Aim

The aim of this interview was to understand the role of MSB in the IPA chain, as well as acquiring this organization's point of view regarding the implemented SMS solution and other potential digital services.

2.6.2. Process

The interview was performed with Lars Olsson, who is the Senior Service Manager for Public Warning Systems at the Fire & Rescue Service Section, and Håkan Marcusson, who is MSB's system Architect for Public Warning Systems at MSB. The interview was semi-structured and performed through a video call from Publicis.Sapient offices. The interview lasted for approximately 45 minutes. (The interview guide can be found in Appendix II.)
During the interview the informants were asked to describe the role of MSB in the IPA chain, questioned regarded their view on the SMS solution and other potential digital services, and how they believe that 'Authority'- and 'Important Public Announcements' should be communicated to the general public.

2.6.3. Outcome

MSB is responsible for the IPA chain, and SOS Alarm is responsible for delivering the service to the public. This means that MSB finances the IPA SMS solution, provided by SOS Alarm. During the interview, MSB stated that the most important aspect regarding public warning systems is the speed by which messages are delivered. It was stated that a very important aspect of a public warning system is to "do their part of the deal", meaning being able to deliver information as fast as possible to the receiver that people has. Therefore, MSB is in favor of introducing the Cell Broadcast technology to Sweden as this technology is a lot faster than the already implemented SMS solution. If people choose to turn off the feature it is a personal choice which MSB is not responsible for.

"*An SMS message is not a warning. It takes a too long time*" according to Olsson who stated that it can take up to an hour to distribute an SMS to all targeted recipients. MSB considers it as potentially problematic when a message is delivered too late and contains instructions dependent on broadcasted sources, such as "*Listen to the radio for more information*". If the message on the radio has already been broadcasted or is not available

when the user receives instructions, the message is useless and causes unnecessary confusion. A more reasonable timespan for everyone to receive a message to their phone is within minutes. However, Olsson and Marcusson stated that an SMS can be considered as a good complement to the part of the general public that does not have a phone capable of receiving a Cell Broadcast message.

2.6.4. Evaluation

This interview with MSB provided new insights into how the chain of IPA operates. It further provided a new perspective on the IPA service, as well as an understanding of the point of view of MSB when it comes to public warning systems. This interview also added a perspective on the SOS organization and role. Furthermore, it provided a better understanding of the Cell Broadcast technology and why this is preferred by MSB.

3. User Research

In this chapter user research, both the processes and the results, are presented. Through this user research insights on how the PWS should work for the end users (the public) were developed. The user research include interviews, workshops and a survey.

3.1. Aim

The aim of the user research was to understand what needs, requirements and wants the public has in terms of important information regarding crises and situations that occur in society.

3.2. Pilot User Research

In this section, the aim, process, outcome, and evaluation of a pilot user research are presented.

3.2.1. Aim

The aim of the pilot user research was to acquire insights on what aspects and which focus areas the following user research should cover.

3.2.2. Process

One interview was performed with a person who was in proximity to one of the Swedish forest fires during the summer of 2018. This was of interest as the interviewee had paid close attention to the Important Public Announcements distributed during the summer. The questions asked concerned how the person obtained information regarding IPA, what information the person received, and what kind of information she felt was missing. Also, the interview ended with an open, unstructured conversation (without interview guide), which provided additional insights on topics interesting to study further. (The interview guide can be found in Appendix III.)

3.2.3. Outcome

The interviewee mainly received the information about the forest fires through terrestrial television, where the interviewee stated that the text strip was present at all time. The information was deemed to be enough for the interviewee, as the basic information, such as location and type of crisis, was provided. However, even if the location was stated, the interviewee still searched for more information by, e.g. looking up the location on a map, this to understand how the IPA affected her if the named location was unfamiliar.

The interviewed person was not in immediate danger at any point during the summer. The distance between her and the crisis was approximately 70 kilometers. This was deemed as short by the interviewee, as it was mainly forest between the interviewee and the fire, as well as the fact that the fire was reported as being out of control (in the interviewee's opinion). As long as the interviewee knew which area an IPA was issued at, she felt secure that the danger was clearly communicated. However, there were situations when there was a lack of information in the interviewee's opinion.

The interviewee stated a desire to receive information about a situation even if it might not affect the person directly. The more severe the crisis, the further away one could be and still want to receive information. Also, if a crisis occurred closer, she stated that more information and details than provided about a situation further away would be appreciated. Hence, "*The more information the better*". The interviewee expressed a wish to receive information to their phone, and in particular information regarding where more information was available.

The trust for IPA was high for the interviewee, as she perceived it as a service only used when needed. When asked if too much information could be experienced as tiering, she stated that it depended on how important the information was.

3.2.4. Evaluation

When being in an area with an active crisis, the need for relevant information is high. Stating a specific location with text might not be enough information, as the interviewee searched for more information on where that location actually is. That awoke the question if it is a matter of life; should persons being informed through an IPA have to rely on working internet connection to find out if the information is relevant for them or not? The interviewee claimed that the information provided was enough to satisfy the basic needs, but further stated that more information is desirable to feel more secure. This indicated that the amount of information distributed to the public in an alert should be further investigated. It also indicated that what is important information for the public is information that is relevant to them. What information that is 'relevant' information, however, had to be further investigated. Another interesting finding to research further was where the borderline is between relevant and unnecessary information. This was of interest as the interviewee stated that as long as there is some information provided, even if not directly applicable to the user, the interviewee experienced a sense of safety. This might be closely connected to the fact that the participant was in proximity to the active fires.

The interview questions did not line up with the course of the conversation. However, the main topics of the interview were all discussed, and the discussion regarding the topics provided the main areas to focus on for the continued user research.

As soon as the conversation was declared over, and the recording was ended, the conversation became more casual and continued off the record. This indicates that being recorded might have affected the answers to the questions. The conversation provided relevant insights, and is documented in the outcome. However, as this part of the conversation was not recorded some details might have been missed.

3.3. User Study

This section describes the aim, process, and outcome of a user study in this project.
The study was developed to understand how participants wish to receive important information about situations and crises, as well as investigate if there is a relationship between where a situation occurs and how the participants experiences it to be relevant.

3.3.1. Aim

There were two goals with this user study:

- To collect data of how, and in what way the participants would like to receive information about crises and other situations that happen in society.
- To test, and collect data from, a method developed to investigate how far away a situation/crisis can happen from a participant, where the participant still finds information relevant to them.

3.3.2. Method

The user study was set up in Chalmers University of Technology, more specifically in the common room of the Industrial Design Engineering programme. To complete the tasks, the participants needed to spend around 10 minutes of their time.

Altogether 24 students participated, all from Industrial Design Engineering programme. Their ages were between 18-32 years of age. There were three tasks in total for the participants to perform. The tasks were placed in the room as a tour, where there was a starting point in the room and an end after the final task. Once a participant had completed a task, s/he could proceed to the next.

First task: The participants were asked to read what an IPA is and what it is not. This was done in order to prepare for the tasks that followed. The text was printed on two large printed papers that were placed on the wall.

- What is an IPA?
  IPA, Important message to the public, is a message to warn the inhabitants in Sweden when there is an emergency with risk for life and property. It can be sent out through Radio and TV, horns placed all over Sweden (AKA Hesa Fredrik), and can also be sent out as a text message.

  Example of what IPA can distribute:
  Military invasion, terror attack, large-scale fires, gas leak, and toxic smoke.
- What is not a IPA?
  A message similar to an IPA can be a so-called authority message. Authority message is used when it is not a matter of life or death, but when situations can cause disturbance for the population. This is information which can be good to know but is not determined to be important enough to broadcast on a national level through the alerting systems.

  Example of what an authority message can distribute:
  E-coli bacteria in the water, thin ices, or large scale power shortage.

Second task: This task was designed to be an unfacilitated brainstorming session where the participants could write down their ideas of how IPA and information such as authority messages could be distributed.
The questions were:

- How would you like to receive IPA?
- How would you like to receive authority messages?

The participants were given post-it notes and pens to write down their answers and place them on large papers where this station was placed.

Third task: At this station, the participants could pick up five printed paper cards with five different scenarios. Each card included a section where the participants could write something if they wanted to, for example if they wanted to clarify what they perceived the scenario as or if there was any conditions for each scenario. The five different scenarios were:

- Bacteria in the drinking water
- Fire without thick smoke
- Fire with toxic smoke
- Military invasion
- Terror attack

The scenarios were chosen as a mixture of severe situations, which were believed that most participants would consider as important information to attain, and less severe situations, which was believed that it would be nice to know about if happening close by.
The task was to place the different scenarios on a 'distance map'. The distance map, similar to a classic timeline, was a long sheet of paper where different locations had been printed to it. The participants were asked to place the scenario on this map at the furthest distance where this situation could occur, and s/he would still perceive information about this situation as relevant.

The instructions were the following:

> "Important message to the public
> You are here at Loftdet. Place the different scenarios on the line, based on how close something should happen for you to want to receive information which requires your attention for the specific scenario.
> Do you have a suggestion for a scenario?
> Write it on a post-it and place it!"

The different distances ranged from the immediate proximity to the most northern parts of Sweden, i.e. as far away from Gothenburg as possible, while still within the borders of Sweden. The distance map, figure 3.1 and 3.2, had the following steps:

- Industrial Design Engineering Department — Here
- Chalmers — approx. 100 meters away
- Johanneberg — approx. 500 meters away
- Gothenburg city centre — 1,5 km away
- Your home (You are not home) — ~3 km away
- Gothenburg municipality — 10 km away
- Neighboring municipality — 25 km away
- Stockholm — ~470 km away
- Kiruna — ~1550 km away

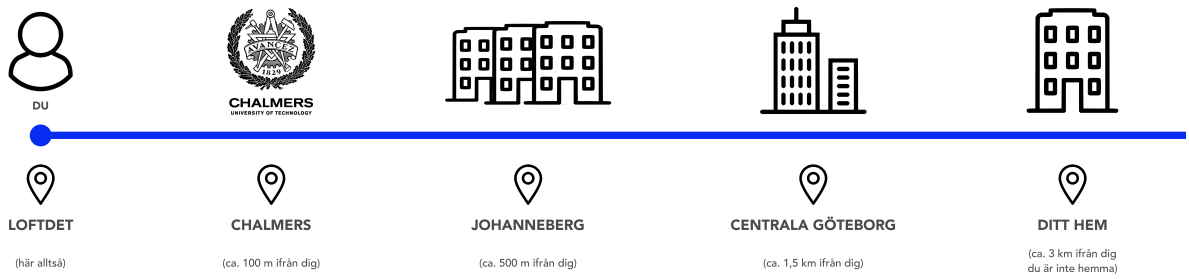

Figure 3.1 displaying the first part of the 'Distance map'

Figure 3.2 displaying the second part of the 'Distance map'

There was also an opportunity for the participants to state that they did not want information that required their attention about the specific event. The option was phrased as followed:

> I do not want information which requires my attention
> Why not? Please write on the note why you do not want to receive information about the specific scenario, use the backside or sticky notes if you want to write more.

3.3.3. Outcome

From the brainstorming SMS was mentioned most times as a desired way to receive information, both for IPA and Authority Messages. Text messages were suggested by 19 out of 54 answers for IPA, and 14 out of 47 answers, regarding Authority Messages. Twelve stated that they wanted to receive IPA through the sirens and six that they wanted notifications on their smartphone. For Authority Messages, 11 stated they wanted a notification in their smartphone.

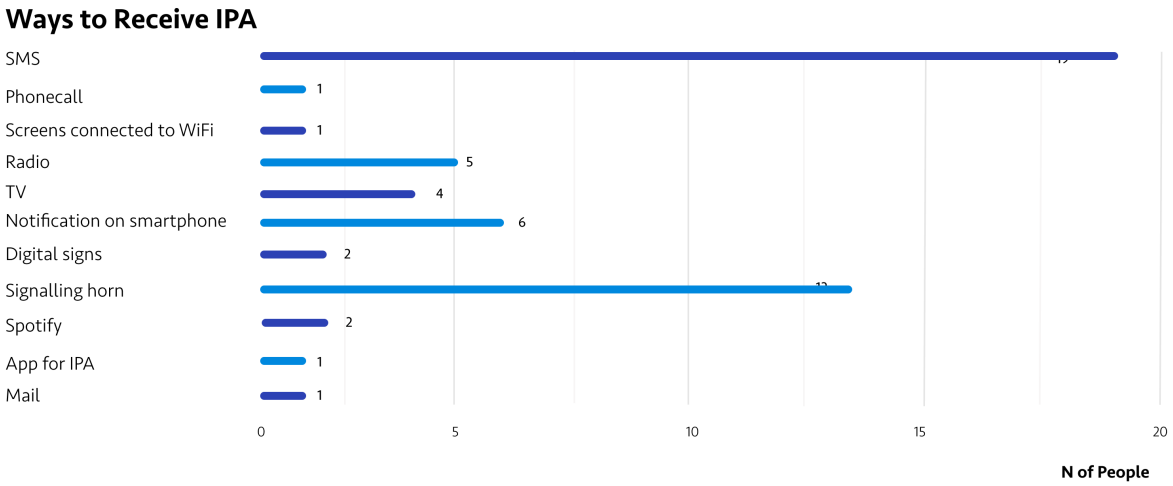

Figure 3.3 displaying how the participants wish to receive an IPA

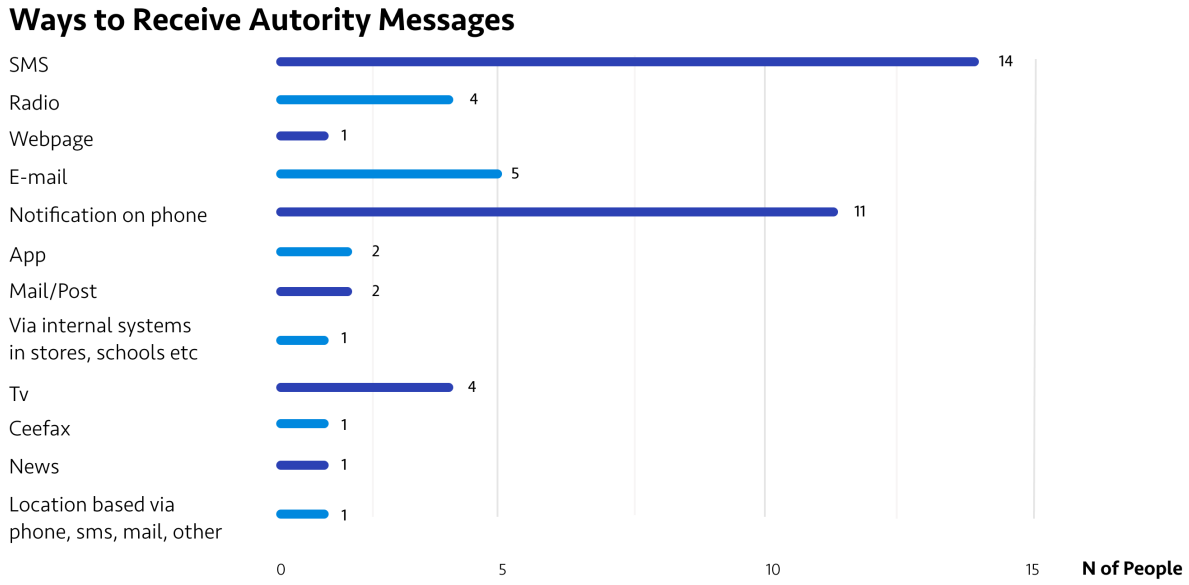

Figure 3.4 displaying how the participants wish to receive an Authority Message

Nine out of 24 participants accepted information about ‘fire without thick smoke’ within a radius of 1,5 km from their current location.

For the situations ‘fire with toxic smoke’ (13 out of 24) and ‘bacteria in the drinking water’ (15 out of 24) the majority of the participant wanted to receive information about the situations if these occurred within a radius of 10km from the person.

For the situations ‘military invasion’ and ‘terror attack’, the majority (23 out of 24 respective 15 out of 24) of the participants wanted information at the distance which was the furthest away possible to select (approximately 1550 km away).

3.3.4. Evaluation

The distances different steps were concretised with locations, e.g Stockholm ~470 km away, which might have affected how the participants related to different scenarios and to what extent they required information. Stockholm is equally as far away from Gothenburg as Mora is, but Stockholm might be more relatable as it is the capital of Sweden and therefore considered as more important than Mora for the participants. Therefore, 3 participants were later asked whether they interpreted the distance as ~470 km away or as Stockholm (the concretised distance). The asked participants perceived the map as intended, with distances and not the actual location. As this had to be asked afterward, this was clarified in the instructions for the next workshop.

“Your home”, was supposed to represent the actual location of one’s home and not the assigned distance. If this was misinterpreted or not by the participants is not considered relevant as the majority opted for obtaining information at a further distance than where the option “your home” was located on the ‘distance map’.

The more severe the situation that the card presented, the further the distance between the individual and the situation could be when the information was still considered relevant. There was also a clear indication that there is an interest to receive information on less severe situations, within the municipality, and large-scale crises nationwide.

In the study, IPA and Authority Messages were defined and examples were provided. It was explained what information that is usually distributed to the general public and what information is not. Results show that the participants wanted to receive information classified as Authority Message and this differs from how the IPA service is designed today. This was therefore an aspect that was looked into further. However, the definition of receiving information in this task was stated as “information that requires your attention”. This could possibly have been interpreted in many different ways. Therefore, this task was reworked before the coming workshop.

Brainstorming in an unfacilitated way was regarded as successful, as there were plenty of different solutions and answers (approximately 2 answers per participant). The answers might be affected by seeing other participants answers but this may also have acted as inspiration. Since the participants were students at the Industrial Design Engineering programme, they are all familiar (to some extent) with brainstorming and participating in ideation sessions. Therefore, an unfacilitated brainstorming was an appropriate tool for the workshop. Nevertheless, it could be beneficial to probe the participants with follow up questions, such as why they want text messages or a notification on their phone.

3.4. Workshop

A workshop is a method for collecting knowledge and expertise through practical work and/or a discussion on a particular subject, during a period of time.[46] This section describes the aim, method, and outcome of a workshop with the public. The workshop was based on the method developed for the user study but redesigned to investigate the relationship between where a situation occurs and how the participants experiences it.

3.4.1. Aim

The aim was to acquire the participants' opinion on how they would classify different types of scenarios on several aspects. The expected outcome of this workshop was to answer the following questions:

- To understand what the participants perceive as important information
- To understand when participants perceive information as relevant
- To understand in what ways participants would like to get access to important information
- To understand what kind of information participants want in different situations

3.4.2. Method

There were six participants in this workshop, aged between 24 to 27 years. All participants were seated in the same room, and the facilitators walked around to hear what the participants discussed.

First, all participants took part in a so called ‘check-in’ where they presented themselves and stated if they had the sound activated on their phones or not. The participants were then asked to divide themselves into pairs. The pairs worked together throughout the workshop, and were encouraged to discuss the tasks.

First task: The pairs were presented with nine different scenarios of various types written on paper. The scenarios were a mix of severe situations, which were believed to be perceived as important for the participants to receive information about, and situations not as severe, which were believed to be not as important to receive information about. The scenarios are presented in table 3.1.

[46] 'Workshop Definition And Meaning | Collins English Dictionary' (*Collinsdictionary.com*, 2018) <https://www.collinsdictionary.com/dictionary/english/workshop> accessed 15 December 2018

Table 3.1 displaying scenarios with information about the situation

Situation	Description
Military Invasion	Confirmed foreign military threat on their way/ currently crossing the border of Sweden
Lethal disease	Confirmed pandemic disease
Terror attack	A terror attack with reported injuries.
Risk of Explosion	Risk of explosion, e.g. gas leak from an industry
Storm	Class 3 storm on its way or currently affecting an area
Fire	Fire in building, visible flames, thick smoke
Non-lethal Disease	In the municipality, for example, E-coli in water
Power Outage	Power outage in an area
Police Event	Local danger, isolated event

The pairs were asked to write down all questions that emerged as they read each of the scenarios. Each scenario had an own paper for questions for the participants to write on, as well as a paper called 'General Questions' if there were questions the participants deemed applicable to multiple or all scenarios. The time constraint for this task were ten minutes. Once the participants had completed the first task, they were asked to keep their piece of paper with questions so that they could add questions if any new emerged.

Second task: For the second task, participants were asked to continue to work in pairs. The instructions were provided both orally and in written text. The pairs were asked to rank each scenario from 1 - 9 according to how they perceived their respective importance (*Swedish: Viktighet*). The scenario ranked number one was the scenario perceived as most important whereas the scenario ranked number nine was thus perceived as least important. The scenarios could not be ranked equally as important. The time constraint for this task was ten minutes.

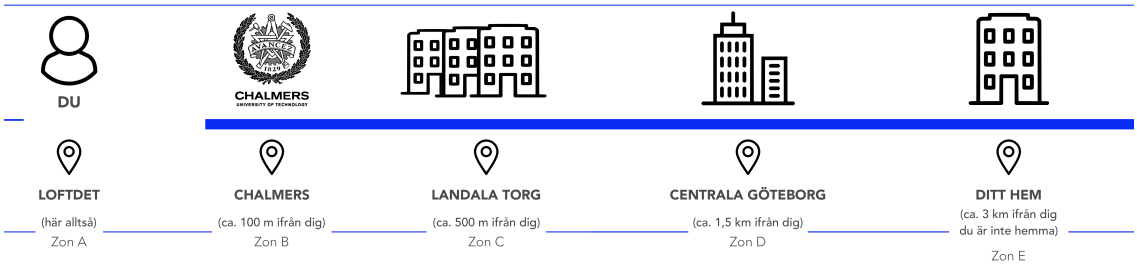

Figure 3.5 Displaying part 1 of the 'Distance Map' used in the Workshop

Figure 3.6 Part 2 of the 'Distance map' used in the workshop

Third task: The third task was similar to the third part of the User Study (see Chapter 3.3). Each pair was given a distance map (see fig x), similar to the map that had been used in the User Study. The different locations and distances are displayed in table 3.2.

Table 3.2 displaying the distances between the participants and the situation

Distances		
Place	**Distance**	**Zone**
Industrial Design Master Department	You are here	A
Chalmers	Approximately 100 meters away	B
Landala Marketplace	Approximately 500 meters away	C
Central Gothenburg	Approximately 1,5 km away	D
Your Home	Approximately 3 km away	E
Gothenburg Municipality	Approximately 10 km away	F
Neighbouring Municipality	Approximately 25 km away	G
Västra Götaland County	Approximately 180 km away	H
Southern Sweden	Approximately 470 km away	I
Entire Sweden	Approximately 1550 km away	J

Participants were asked to place each situation on the distance map where they still wanted information regarding it. It was explained as 'Place each scenario, from the previous task, at a distance for how close a situation needs to happen in order for you to still want to receive information about it. The order of the different situations does not need to be the same as the last task'. The instructions were provided both in writing and verbally. Here, they were instructed that several situations could be placed in the same zone, and the order of the situations from the second task could be changed. The participants were given ten minutes to complete this task.

Fourth task: The participants were asked to keep the distance map and the cards on the tables, as they were provided with a Y-axis with four different levels of urgency. The goal

was to contextualise the how urgent it can be to take part of a information given to them, and therefore they were provided with real life examples as followed:

- Highest level: You are notified when you are standing in the *shower*. You have to stop shampooing your hair to take part in this information
- Second highest level: You are notified during a *meeting*. You cannot avoid getting this information but you can continue with the meeting once you are notified.
- Second lowest level: You are notified during your coffee break
- Lowest level: You are notified once you are home from work or school.

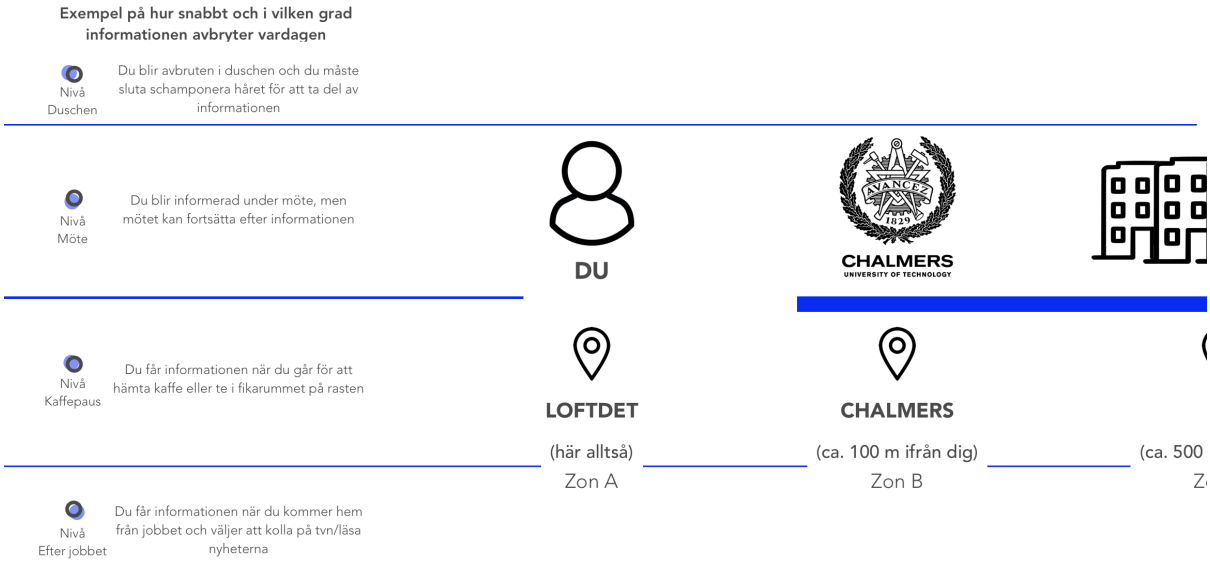

Figure 3.7 Displaying the Level of Urgency axis (in Swedish)

Based on at what distance the scenario was placed, the participants were asked to move the scenario to the level of interruption they found acceptable given the scenario and where it took place.Instructions were presented on written paper and explained verbally.

On each scenario card, there were areas where the participants could fill in what level of importance, which zone and what level of disturbance the specific scenario was ranked as. The participants were reminded, before moving on to the next task, to fill in what they had answered on the scenario card. Their written documentation was saved and revised after the workshop.

Lastly, all pairs shortly described and showed each other how they had reasoned during the different tasks using the distance line and cards. Before leaving, all participants sat down with the moderators for a short discussion about the workshop. Participants were asked if they felt anything was missing, or if there were something on their minds.

After the workshop, the results were photographed and later documented in a spreadsheet. To get an understanding of where average proximity to -, and level of urgency of a situation were according to these three groups, the mean distance and level of urgency for each situation were calculated. The zones and level of urgency were given numbers to be able to provide a rough estimation of where the boundaries could be. These results are presented in the outcome.

3.4.3. Outcome

During the “check-in”, most participants stated that they usually have their phone on either vibrate or mute. Only one usually had the sound on, and this was after work hours.

The result from the first task was that questions regarding had about the situations indicated that the question of *where*, *when* and *what* were the most relevant questions. The participants wanted to know what they should do and how the situation might affect them.

The tasks created a framework for how far away a crisis could occur and the participants still wanted to receive information. At the furthest away a crisis could take place, the participants stated how urgent the information should be presented to them. The participants discussed the difficulty of preforming the tasks as all factors are interconnected. The participants stated that the more likely a person is to be affected by a crisis, the higher the accepted level of urgency is: “*If a situation occurs in my living room, then I would like to be interrupted while I’m in the shower*”. This suggests that the different types of situation requires different types of information, depending on at what distance the person is located at from a crisis. Information is welcome, but needs to be in relation to what extent the situation might affect the receiver. The more severe the situation was perceived as by the participants, the higher tolerance for receiving information of situations far away and with a high level of urgency the participants had.

The mean value of task 2, 3 and 4 can be found in table 3.3.

Table 3.3 displaying the outcome of task 2, 3, and 4

Events			
Importance	**Event**	**Outer Radius**	**Level of Urgency**
1	Military Invasion	Entire Country	Highest Level/ Shower
2	Lethal disease	Entire Country	Second level/Meeting
3	Terror attack	Entire Country	Second level/Meeting
4	Risk of Explosion	~1,5 km E.g City Center	Second level/Meeting
5	Storm	~470 km E.g Neighbouring Counties	Third level/Coffee break
6	Fire	~1,5 km E.g City Center	Second level/Meeting
7	Non-lethal Disease	~25 km E.g Neighbouring Municipality	Third level/Coffee break
8	Power Outage	Your Home	Third level/Coffee break
9	Police Event	~500 m E.g Local Area	Third level/Coffee break

3.4.4. Evaluation

There is a fine line between level 1 and level 2 in terms of the level of disturbance. The user is interrupted in terms of what s/he is doing, but the difference is that the person has to take action immediately. The results show that only a military invasion, no matter where in Sweden it occurs, is perceived important enough for the participants to be interrupted in what they are doing to take action immediately. Terror attacks, a lethal disease, and risk of explosions were considered to be important enough to be interrupted by immediately (i.e. level 2). The remaining five situations were still considered relevant, as the participants stated that they wished to receive information at the stated distance but not as urgent.

Some of the situations that the users evaluated are situations that are not usually considered as severe enough to be broadcasted as an IPA. These situations were included with intention to investigate if the current legislation matches the expectations of the public. The participants did not think of these situations as less relevant for them, as long as it happens in a proximity where they expect the situation to affect them to some extent. This result is in line with the results from the user study. This presents new opportunities for SOS Alarm to distribute information to the public, without the current division of Authority Message and IPA. As long as the information presented to the public is experienced as likely to affect them, and is presented in a reasonable urgency level based on the severity, the public are likely to want information.

The framework from the different tasks sets the outer boundaries for when a person no longer cares about a situation. If a situation happens closer that the outer boundary, it is more likely to be experienced as affecting the person in some way and, therefore, considered as relevant to receive information about. As the participants stated that how *far away* a situation happens, how *urgent* they need to take part of the information and how *severe* the situation is is interlinked it can be assumed that the closer the situation happens, the more severe it will be experienced as and the information can be presented in a more urgent way.

If there had been more time allocated for the workshop, it would have been interesting to let participants select one or more scenarios and let them place how close something must happen in order for them to be notified at each level of urgency. This could have provided more clear directives as to where the boundaries are in terms of the level of urgency. However, how valid the results from such estimations are can be debated as people probably react differently when in an actual, stressed situation. It can also be debated how ethical it is to expose users to a test of information boundaries that comes close to a real emergency situation.

The workshop benefited from hearing the discussions in the pairs, and also having the opportunity to clarify the tasks when needed. One improvement compared to the user study was to illustrate the level of urgency as four comprehensible and real-life situations. It was suspected that participants in the quantitative workshop did not really grasp what was meant by “interrupted by information”. By further illustrating this with examples, it is believed that this helped the participants’ understanding of what an interruption actually meant. Another improvement was the refined distance map, where the distances was clarified and also explained to the participants in comparison to the user study.

3.5. Survey

A survey was conducted by questioning how the participants have been reached by IPA:s, how they would like to receive and are currently receiving important information and to map out characteristics of a population[47].

3.5.1. Aim

The main aim of conducting the survey was to acquire a large amount of quantitative data regarding IPA from a large number of people, in particular the part of the public with more digital media habits to understand what information they wish to receive and in what way(s). Another aim was to understand how they had received IPA earlier, how people usually search for information regarding crisis and society, and to what extent they perceive information as useful.

3.5.2. Process

The survey was conducted online through Google Forms. The questions were designed to investigate the public's experiences of and views on IPA. Some complementary questions were included regarding demographics to see how representative the participants were compared to the general public. The questions were tested and iterated before the survey was sent out. The survey was distributed through social media, such as Facebook and LinkedIn. (The complete survey can be found in Appendix IV.)

3.5.3. Outcome

The survey had 172 participants. The questions were not mandatory and multiple answers were possible to select. Therefore, the sum of the answers to different questions does not add up to 172. The outcome is divided into two categories; *Demographics* and *Statistics about Important Messages to the Public*.

3.5.3.1. Demographics

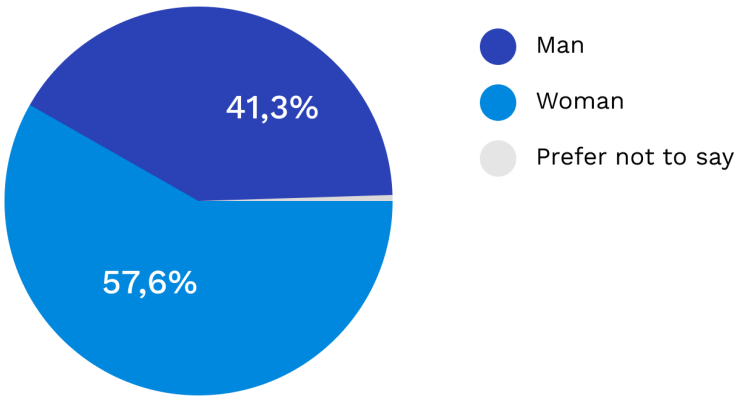

Figure 3.8 displaying the gender distribution in survey participants

[47] 'Survey Method - Research-Methodology' (*Research-Methodology*, 2018) <https://research-methodology.net/research-methods/survey-method/> [accessed 9 October 2018.]

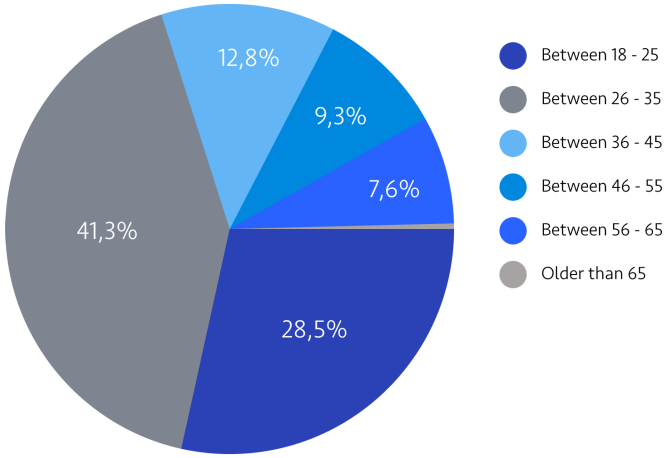

Figure 3.9 displaying the age distribution of the survey participants

Almost everyone (98,3%) stated to be comfortable with using technology, such as smartphones and computers, while 1,2% stated feeling uncomfortable with the usage of technology and 0,6% stated feeling comfortable to a certain extent.

All but four Swedish counties were represented with at least one respondent but the majority of respondents was from either Västra Götaland or Stockholm County (43,9% respectively 16,4%). This is represented in figure 3.10.

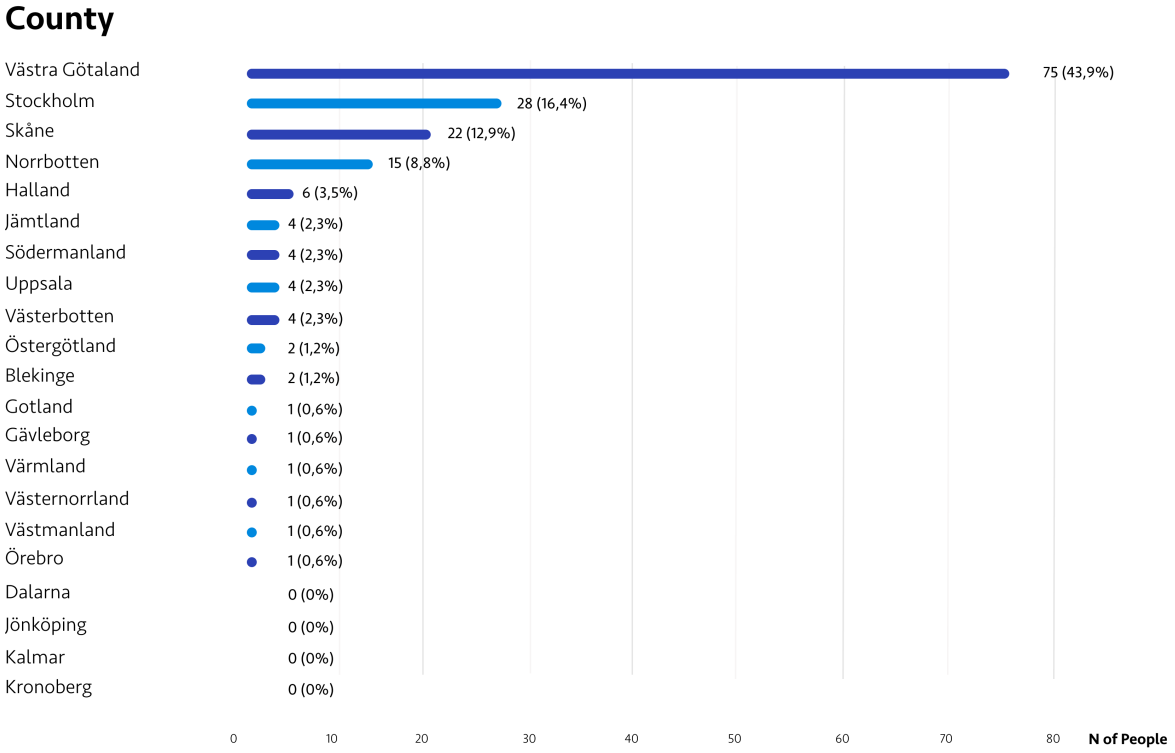

Figure 3.10 displaying the represented counties in the survey

3.5.3.1. Statistics about Important Messages to the Public

The most common way to receive an IPA was through television (43%). Other channels were through radio, both broadcasting (33%) and through SR app(32,1%). A smaller percentage (8,1%) of the participants had received an IPA through MSB:s app '*Krisinformation' (Translated to English: Crisis information,* will hereby be referred to as Krisinformation*)* which is an app where you can specify personal preferences on which areas of Sweden you would like to receive information. For all responses, see Appendix IV.

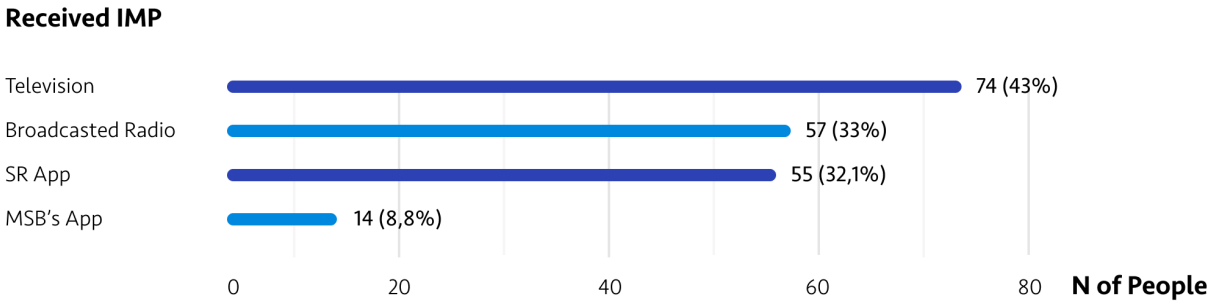

Figure 3.11 displaying how the participants had received an IPA

When asked if and where the participants would search for more information after receiving an IPA, the majority (67,9%) stated online internet news sites. Results displayed in figure 3.12

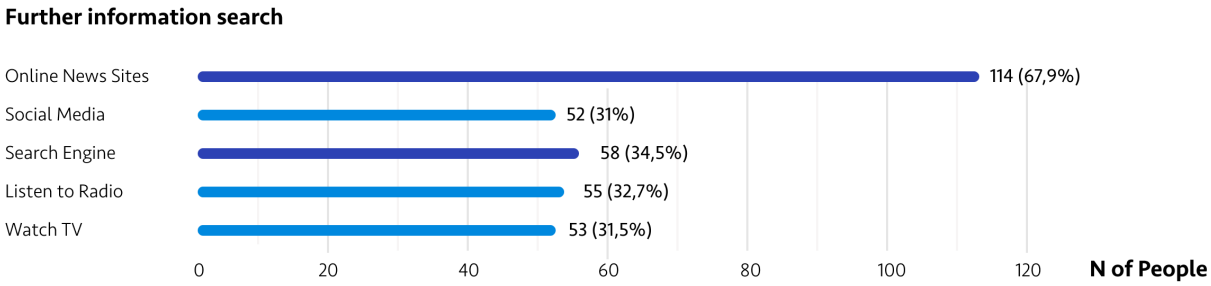

Figure 3.12 displaying how the participants search for more information

Regarding what services the respondents used to attain important and urgent information about the society, the results were similar. The majority would consult an online news site (63%). The alternatives: 'Through search engines', 'Social media', and 'SR app' received approximately 28% each of the votes. Approximately 24% stated that they would watch TV and listen to the radio and18% stated receiving such information through MSB's website Krisinformation.

Out of the participants 76,2% responded that they would like an SMS with urgent and important information, 61% wanted to receive it automatically to their phone or computer, and 43,6% stated that they would like to receive it through an app.

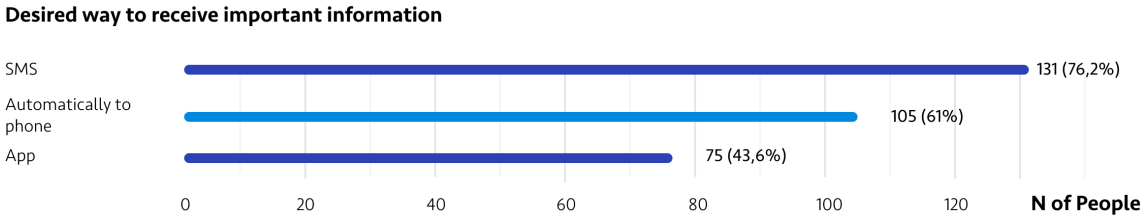

Figure 3.13 displaying how the participants with to receive an IPA

When the participants would like to receive important information was when it concerns their immediate proximity (89%), close to their home (88%), and situations affecting the municipality but not themselves directly (71%). 37% stated they also wanted to receive information about situations regarding national matters but not themselves directly.

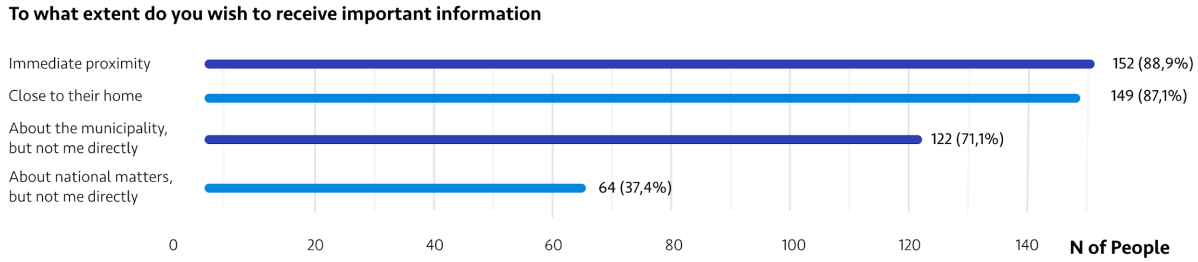

Figure 3.14 displaying to what extent the participants wish to receive important information

Regarding what kind of situations they would like to receive information about, the statistics show that there are some situations that almost everyone wish to receive information about. This includes 'Life threatening situations' (98,8%), 'Warnings before natural disasters' (89,5%), 'Information during a natural disaster' (92,4%), and 'Threats against the nation'(97,1%). In situations like 'Risk for properties'(72,7%), 'Risk for non-lethal diseases'(65,7%), and ' Disturbance in societal functions'(54,1%), a majority of the respondents still wanted to receive information, but noticeable fewer compared to the other options.

Regarding content, the participants would like to receive information regarding where more information is available (79,7%), if they have to evacuate (77,3%), recommendations about what they have to do (64,5%), information about what has happened and what measures are being taken (51,7%), and detailed information about what has happened, what measures are being taken and what one should do (48,3%).

The participants were also asked what aspects they find important and if they had any ideas of how IPA could be distributed in the future. The following topics were often mentioned in the answers:

- Send information to mobile phones
- Provide information on different language
- Reliable sources, difficult to hack
- Location based information
- They must be trustworthy and not feel like spam

A complete list of the answers can be found in Appendix IV. These are presented in Swedish.

3.5.4. Evaluation

The survey was distributed through social media, which means there is a risk that it did not reach people who do not use these platforms. However, as the service being investigated aims to understand how to reach the part of the public that use digital media often, the participation selection can be argued to be successful. The majority of the participants are considered to be part of the younger generation which also is the ones consuming less traditional media (as found in the literature review, see chapter 2.2). Almost all participants were also comfortable with using technology, again showing that the survey reached the intended part of the population.

The survey allowed the participants to choose multiple answers. Forcing the participants to choose one answer was regarded as difficult, as it would have been important to understand why they chose that specific answer.

Allowing the participants to write what they perceived as important aspects when thinking about information regarding crises and other situations that happen in society provided insight and ideas which were taken into consideration when ideating and developing a concept. Furthermore, their ideas on how the future IPA could work added to the idea bank. In these questions, several participants stated they would like to have an app to choose what type of information they would like to receive. At the same time, only 8% of the respondents stated that they receive information through the Krisinformation app, an app which is similar to what they are explaining they would want. This can be argued to strengthen the arguments from the benchmarking study, that the majority of the population would not download or use an app.

There is a risk that the questions were misunderstood, as some participants answered that they had not received any alerts, and at the same time stated that they have received alerts through different channels. To avoid ambiguity, the survey could have been designed differently. As an example, the participants stating that they have never received an IPA could have been forwarded to relevant questions based on their answers.

The results of how the population finds important information about society were clear, it happens online most of the time and to some extent through public service. As the majority finds information online, this indicates there could be a risk of a lack of information in a larger crisis when the network potentially is congested.

The results are similar to the results from the user study and workshop. The participants wanted to receive information about more than just their immediate proximity and situations which might not be life-threatening.

3.6. The Emergency Service's Perspective

This section describes interviews conducted with 112 operators with the intention to identify the needs of the public from operators who talk to people calling 112 in a crisis, seeking help and guidance. Furthermore, a presentation of the 112 operator workflow is provided, from answering a call until their work task is considered completed.

3.6.1. Aim

One aim of the interviews was to identify uncertainties that the public has in the event of a crisis from the perspective of the 112 operators at SOS Alarm. Further, to understand the 112 operators' work situation, as well as how communication and how the flow of information operated within the SOS Organization.

3.6.2. Method

Three semi-structured interviews were held with three different 112 operators, one with experience of discussing IPA:s with Rescue Officers and one that instructs and mentors new 112 operators and one with several years of experience working as a 112 operator. All three operators have long experience of answering emergency calls. Each of the interviews lasted for approximately 30 minutes. The interviews were held at the SOS Alarms' call-center in Gothenburg. The interviews were recorded and digital notes were taken. Questions asked regarding what the public asked when they call 112, what information is the most important for 112 operators to carry out their work, and what the role of the 112 operators is in an emergency situation. The interviews were held in Swedish, and the interview guide can be found in Appendix V.

3.6.3. Outcome

The 112 operator is the channel between the public and the emergency services. The 112 operators work on a national level, which means that an operator answers calls from all over the country. In order to assist in an emergency situation, the operator follows a set list of questions in a specific order. In the interview guide that the 112 operator uses, there are *Temperature Questions* which are used to classify each situation as a low, mid or high priority situation. These questions are the most important questions that the person reporting the accident answers, as they set the priority of the situation in relation to the other reported incidents.

Depending on the character of the call (i.e. rescue, medical, police), the software used by the 112 operators called CoordCom suggests co-listeners from appropriate resources, from the area that the situation has happened in, to join the call. The co-listeners listen to the call and plan what resources are required to be sent to the site. When the operator and all co-listeners have the information they need, the operator ends the call.

The operators stated that 112 could receive several calls about the same situation, where only one call would be enough if the caller can provide sufficient information. Often 112 operators also receive calls from the public asking for information about something that is happening, hoping to receive information. The interviewees stated that this happens because there is not enough public awareness of the informational number 113 13. These calls require a lot of time, and the 112 operators cannot give out information to the public.

The operators stated that the most wanted information from the public during a phone call was "When will you be here?". The people calling the emergency number tend to ask more questions if the situation that they call to report is less severe.

Another fact that became apparent was that the Rescue Officer often has a discussion with the Rescue Dispatcher if a situation should become an IPA or not. It also occurs that the

rescue dispatcher helps the rescue officer to connect to KBA for a discussion about a potential IPA.

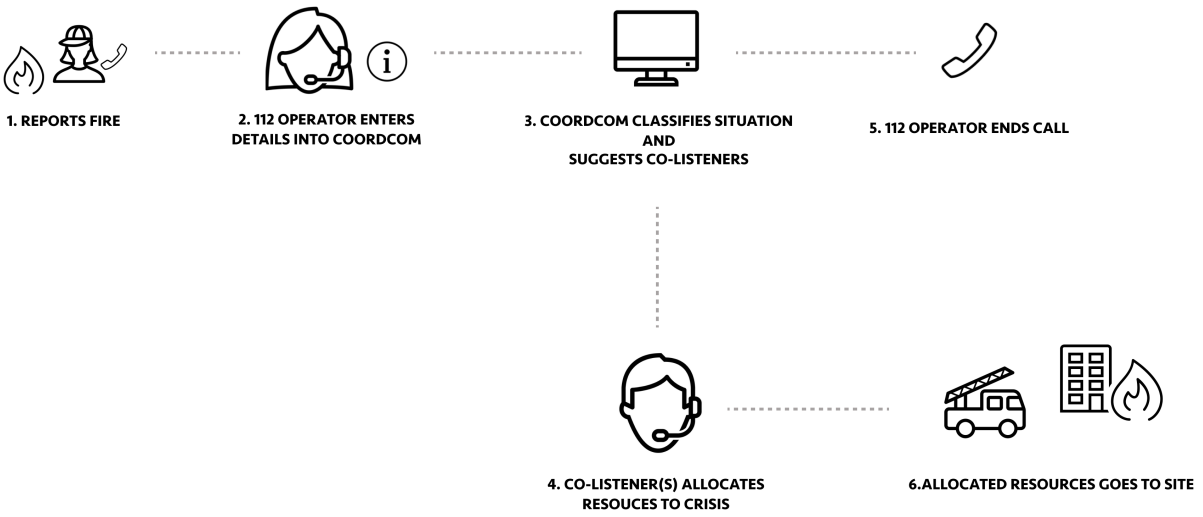

Figure 3.15 Displaying the process from a 112 operator receiving a phone call about a fire until the rescue services start to manage an accident.

3.6.4. Evaluation

The aim of the interviews was to understand what questions the public asks when being in or close to an emergency situation. An initial assumption was that the public, in general, had a lot of questions to the 112 operators in a crisis but it was apparent during the interviews with the 112 operators that the public, in general, asks few questions in a crisis. The main question in an emergency is when the emergency services will be there to help them.

The number of calls made to the 112 number to receive information, and the amount of calls to report an accident already reported might imply that there is a need from the public to receive information at a fast pace and possibly also being provided with information to a greater extent than at present.

The rescue officer and the rescue dispatcher usually have a discussion about whether or not a situation should become an IPA or not. As sending an IPA is not a common task for the rescue officer, this supports the idea that there are uncertainties regarding what is an IPA and what is not, similar to the findings from the literature review. If this is the case, the responsibility for issuing an IPA could possibly be shared with some part of SOS, e.g. 112 operators or KBA.

It was an interesting fact that *Temperature Questions* are used to classify and to set the priority for the situation already at the very first stage when the 112 operator receives the call. If a classification is made at this stage, this information could potentially be used for a local informational message and possibly be distributed already at this stage of the process.

The interviews made can be argued to be few; only three. However, the three operators gave very similar answers to the questions. This might, of course, be due to the fact that

they are in the same workplace but most probably also due to the fact that the operators' work tasks are very standardized. They follow a strict interview guide developed to not miss any important information and to provide all co-listeners with the information that they need. Therefore, a saturation level was reached fast.

4. Implemented PWS Technology Research

In this chapter, further studies regarding Cell Broadcast and SMS are presented. These studies are in the form of interviews with experts that has been a part of the implementation process of the PWS in respective country. Cell broadcast has been implemented in the Netherlands, and SMS is implemented in Sweden. The interviews were conducted with stakeholders who were part of the implementation of the technical solution in the respective country.

4.1. Interviews about CB Implementation and Technology

In this section, two interviews regarding Cell Broadcast technology are presented.

4.1.1. Aim

The interviews were conducted with the aim to acquire details about the technology and implementation of a cell broadcast service, both from a provider's perspective and from a country who have implemented such a system. Furthermore, how the implementation of CB worked in the Netherlands and their experience of the system, and also an estimation what the costs for such a system was investigated.

4.1.2. Process

- One of the interviewees was John Tacken. Tacken is a consultant at Hamilton Turing. John was project manager for implementation of NL-Alert on behalf of the Ministry of Justice and Security. NL-alert is the Netherlands name for their PWS, which uses CB technology.
- The second interviewee was Peter Sanders who is the Product and Standards Director, at the company One2Many. One2Many provides CB solutions and provides e.g. the PWS to New Zealand.

For both interviews the same, structured, interview guide was used. The interviews lasted for approximately 40 minutes each and covered topics such as CB possibilities today, current usage, security and future plans for development. Digital notes were taken and the interviews were recorded. Some details were clarified in email conversations after the interviews. (The interview guides can be found in Appendix VI and VII.)

4.1.3. Outcome

CB is a one-way, priority one, broadcast communication service that offers the possibility to send a message to all mobile phones through 2G, 3G, 4G, and in the future also 5G network. A priority one service means that there is always a channel open in the network for such information and messages. A CB message can reach all phones within an assigned area, one or more cells, within seconds after sending a message.

A CB message looks like an SMS message, but the technology should be compared to radio as the message is broadcasted inside an area rather than sent to a specific phone. The service is, like the radio, an anonymous service. The CB centers broadcast a message to all recipients, without any knowledge of how many there are in a cell, or who are within the borders. The message is a priority one service and sent through the same towers as all voice and data traffic, a priority one service means that it uses a separate channel and this

one is always open for CB messages in the network. The messages are broadcasted to a cell, and how precise the area covered is dependent on cell sizes, mobile towers and other factors such as weather, large buildings, and other geographical factors. The area where a message is broadcasted is typical minimal 1 square kilometer in urban areas to 30-40 square kilometers in rural areas.

4.1.3.1. International Standards

CB messages follow an international standard for how messages are displayed on a phone. For example, the message overrides the screen with a specific signal and vibration that differ from other regular notifications. The message can be repeated within the cell to ensure that when a new phone enters a cell where a message is broadcasted, the phone will receive it. The repetition rate of the message can be tailored depending on the situation. The content of the message can be a maximum of 15 pages x 82 octets (which means 1395 characters long message) exclusive of the three other components as are described in the following paragraph:

1. The text message with information to the recipients
2. A message identifier (what type a message is) where the different identifier are as followed:
    a. Presidential Alert *(opt-out not possible)*
    b. Extreme
    c. Severe
    d. AMBER aka. Missing children
    e. Test message
    f. Follow up *(will be live in May 2019)*
3. The serial number of the message for the phone to recognize and filter out duplicates of the messages
4. Data Coding Scheme. Used to identify what character encoder the phone uses (GSM7 or USC-2)

4.1.3.2. Vendor dependent aspects

Android and iOS support CB natively, which means that recipients do not have to install or perform an action to be able to receive a message. Some phone manufacturers will, however, need to be contacted to activate CB usage in the specific country. It is the phone vendors (such as Apple, Samsung, etc.) who decide what the message should look like, if the users have to press ‘OK’ to close the message, or if the message is possible to view again (such as saved in a native app or viewable in the notification center). Some argue that stored CB messages are a risk, as the phone itself cannot tell the user whether the message is still active or not. This can be compared to storing a radio bulletin; you can always listen to it but do not know if it is still relevant. If there is a need to update the information, a new message will be broadcasted. The message does not indicate that it is an update to avoid confusion and stress, as this update might be the first message a user receives.

4.1.3.3. Security aspects

In terms of data protection and security, both participants stated that CB is a secure technology. Cell broadcast messages can only come from one source (SMS messages do not), so a receiver can rely on the fact that the originator is authentic. Hacking the service is also considered as very difficult. One reason being that the service is not necessarily connected to the internet. Tacken states nevertheless that this is not given. The system

needs to be designed that way. The impact of a hack is huge since a hacker could potentially reach all citizens which could mean the end of the PWS. It is however deemed to be a lot safer compared to other PWS alternatives such as SMS or applications. None of the participants could see any commercial usage of cell broadcast, and the only business-case for CB for PWS.

4.1.3.4. Future features

There will be a launch of new features for Cell Broadcast in 2019 by One2many, according to Sanders.

- An additional level of CB messages where it is possible to specify where shelters can be found, where to find water etc. (Will be launched in May)
- Polygon technology, which offers a better precision when targeting an area for a broadcast message (Will be launched in November)
- The message identifier is to be divided into two blocks (Will be launched in May)
    - Block one displays messages regardless if the receiver speaks the language or not. A CB message of block one will always override whatever language settings there are on the user phone.
    - Block two contains a language filter. If the receiver has stated that they want to receive a message in a particular language, then the message is displayed accordingly.
- Ability to store and retrieve message again for 24 hours (Will be launched in May)

4.1.3.5. Implementation of CB in a public warning system

In 80-90% of the cases when an NL-alert is broadcasted through CB, the emergency is a fire with toxic clouds. The decision time to issue a CB message to the public is quite long, but when the first message is broadcasted it reached the public within seconds. To reduce the time taken, the Netherlands are looking into moving the decision towards the front of the process to be able to warn before knowing certainly there is a risk for life and health.

Approximately 95-98% of the phones you can buy in the Netherlands works with CB and the usage of this technology was introduced by a campaign. To evaluate how many people in the Netherlands are reached by the alerts, a test message is issued twice a year. After the test message has been issued, NL-alert ask about 2000 people how many of them received it. The percentage of people receiving a message was to begin at 9% but at the latest measurement in December 2018 NL-Alert reached 74% of the population with a test message. The main concern before implementing the system was that not enough people would be reached. However, the results are satisfactory, and the sirens are intended to be dismantled by 2020 as the NL-alert distributed through CB is deemed to be suffice. NL-Alert has recently also been expanded to information boards in public transport.

When a message is broadcasted in the Netherlands, NL-Alert usually use a maximum of 200 characters, and the message structure is as followed.

1. Stating it is an NL-Alert
2. Timestamp (i.e. time of the day and date)
3. Source of the crisis, what has happened and where
4. Advice on what the user should do
5. Follow up information, which can be for example information about where more information is available

Typically, the broadcasted message is the same to all recipients, but it would be possible to broadcast different messages to different areas. However, there could be an issue if areas are overlapping. There was a project developed at the University of Delft, where a guide with messages was developed to be used in the NL-alert. The guide is used for training purposes but is not used when “real” messages are issued. This is as the rescue personnel experience every situation as different and feel the need to formulate the messages themselves. Tacken states that every individual messages formulated by the government should be understandable for every user, independent of the fact whether a user received a previous message.

The alerts are mostly used for fires, storms, and test-messages. When a message was not deemed necessary, and therefore not sent out, people read or heard about the situation in the news and asked why they did not receive an alert. This suggests that the public requires more information regarding situations or crises that occur in society. The future of emergency alerts would be to expand by using more channels, such as social media. The challenge associated with implementing the system was to get the phone operators to participate, as it requires an investment of roughly one million euro for them to be able to send out CB messages. They are not onboard and CB works in the entire Netherlands. There was also an investment to acquire the software to send out the messages from the emergency managing company.

To use Cell Broadcast in Sweden, a CB center has to be set up in every mobile operator in Sweden. Furthermore, it has to be activated in the radio access network. An estimated cost for a center is between 100 000 - 400 000 euros. Cost of support will approximately be 10-15% of what it costs to set up a center. When implementing CB in a public warning system, it is possible to tailor the service to suit local needs. For example, it is possible to create different ringtones for different types of messages and change the how it is delivered to the user (i.e. with or without making a sound, how it appears on the screen etc.).

4.1.4. Evaluation

Cell Broadcast appears to fit the proposed service, as it is possible to tailor the service to Swedish needs for a PWS. From a user perspective, the service is promising considering the possibility to opt-out from messages the users do not wish to receive, unless for the highest level of alert. This means that if a user chooses not to receive information, they will not be disturbed by information that they would consider irrelevant. Based on the results in the Netherlands, the way of receiving a message with cell broadcast is deemed as successful as people express wanting one when none has been broadcast. This suggests that the public relies on this service and that the CB messages are welcomed. Finally, the fact that security is considered high is, of course, beneficial from both a user- and an SOS Alarm perspective.

From a methodological perspective, the interviews were conducted online and it was at times difficult to hear what the interviewees said. Therefore, it was valuable to be able to send e-mails to the interviewees for clarifications. Nevertheless, these interviews provided a deeper understanding of the functionality of CB and the possibility to verify a lot of facts received through other channels. These interviews provided first-hand information on CB and about possibilities implementing this kind of technology in Sweden.

4.2. Interview with the IT department at SOS Alarm

In this section, an interview with one person from the IT department at SOS Alarm is presented. The interview focused on the part of the IPA service that involves distributing SMS messages.

4.2.1. Aim

The aim of the interview was to understand why the SMS solution was chosen and implemented in 2017, and what visions the IT-department has for Important Public Announcements in the future.

4.2.2. Process

One interview with one person from SOS Alarms IT department was conducted. The interview was structured interview and conducted in person at SOS Alarm premises. It lasted for 40 minutes, and digital notes were taken during the process and the interview was also recorded. (The interview guide can be found in Appendix VIII.)

4.2.3. Outcome

Before implementing the SMS solution, the candidates for a mobile IPA were Cell Broadcast and SMS. SMS was selected with the main motivate that SMS can reach everyone with a mobile phone, without any installation required by users. It was also selected because CB technology did not exist (and still does not) exist in Sweden. Other arguments were that there is no chance to opt-out from receiving an SMS and that it is not possible to 'hide from it'. It is also possible to find the information again. An IPA SMS reach approximately 94-95% of the targeted recipients. Given that there is no congestion, the lowest capacity of sending an SMS has been measured to 200 SMS messages per second. The highest possible rate at the SMS messages can be distributed is 800 per second by the largest phone operator in the country. The speed depends on the capacity of the mobile operator. All SMS messages are sent with a validity period of one hour, which means how long that the SMS center will try to send the message to a phone. When Geofencing is introduced, this validity period will be prolonged until the "Danger is Over"-message has been sent.

For the future, the SMS solution is expected to become more precise with Geofencing and Follow Up Alert. Geofencing means surrounding a geographical area with a virtual fence, where for example SMS can be sent to the targeted area inside the fence. This allows for more targeted SMS messages to the public, compared to today. It means that everyone that does not receive the message initially will receive it as soon as they enter the area inside the virtual fence. Follow Up Alert means that the SMS system keeps track of recipients of the IPA, and sends a follow up message stating that the *'Danger Is Over'* to everyone that received the first message. This makes it more likely that that the information that danger is over is communicated to everyone that was reached by the first message.

4.2.4. Evaluation

This interview provided first-hand input on the view of the IT-department at SOS Alarm regarding the strengths and weaknesses of the implemented solution It also provided a better understanding of the internal plan for the IPA, which gives a perspective to the developed concept and what the IT department finds important for their users.

It is evident that SMS was selected because it is the most accessible solution for the Swedish population, as all phones can receive an SMS in contrast to Cell Broadcast messaged which needed to be configured on each phone (at the time an SMS solution was investigated). The lack of possibility to opt-out is considered to be positive, which is contradicting to what has been discovered and classified as a positive aspect for CB in this thesis project. It was understood that the negative aspects of this solution are that it is a slow service if a message is supposed to be sent to many mobile phones, as this is a one-to-one service. However, for sending out information to smaller sized areas with 200-800 SMS per second, SMS has the potential to reach the public at a fast pace. The risks are that if there is congestion in the data network, or if a too large an area is selected to distribute information to, the messages will most likely not reach the public in time.

5. Conclusion of Part 1

From gathering and analyzing the data collected 7 main insights were defined:

1. The public wants to receive information, even if not at immediate proximity to a crisis. From interviews, the less severe the crisis is, the more questions are asked. When in a severe crisis, in general, the public only wants to know when help is coming. This argues for informing to a larger extent than only the immediate proximity to a situation.
2. People tend to care if they perceive a situation as likely to affect them. A severe situation is more likely to affect to some extent, while a smaller scale crisis might not. Also, the receiver of an IPA should be aware of why it is affecting them, so the person present in a crisis does not have to search for information to understand if the information received affects them or not.
3. The public does not care about if it's an Authority Message or an Important Public Announcement, they simply wish to receive relevant information.
4. The Cell Broadcast technology makes it possible to communicate in different urgency levels, which makes it a suitable way to communicate relevant information to the public, no matter if it's life-or-death situation or merely information which is nice to know.
5. The SMS solution was selected for the Swedish PWS based on recommendations from FVM, mostly due to the fact that all phones can receive an SMS by default.
6. The 112 operators software *CoordCom* classify situations at the time they are reported, using the *Temperature Questions.* KBA has access to this software as well and can see all current situations reported into CoordCom.
7. Using a service to communicate information to a larger extent than the immediate proximity might be a solution to reduce unnecessary calls to 112. There is also a possibility to strengthen SOS Alarm's brand equity, as being the center for crisis communication if communicating to the public in a crisis.

Part 2: Defining the Solution Space

This part defines the gathered data into key insights for a solution to distribute information to the public. The solution space is where the identified demandsfrom the public and the technological opportunities and limitations meet. Furthermore, this part contains ideas and concepts, and an evaluation of these. Investigation of how a concept could be implemented will also be presented in this part.

6. Defining Users Demands

The next step in the process was to analyze the collected data from the Research of the PWS and the User Research. Through this chapter, a list of demands could be formed to use as a reference for the concept development phase.

6.1. Aim

The aim of this section to identify demands for a service for providing relevant information to citizens from user perspective. The aim is also further to investigate the technology options found in the previous phases. This was done in order to investigate how well these options could be used for a digital PWS with regards to identified demands in this section.

6.2. Method

An analysis of the pilot interview, the user study and the workshop was made to identify patterns in what the users demand from a PWS. Furthermore, an analysis of all interviews with the 112 operators, KBA, MSB and stakeholders at SOS Alarm was performed. This to find user demands from another perspective, as these interviewees have a vast and varied experience of the emergency services and user demands in terms of crises.
To fully triangulate demands for a PWS service, an analysis of the benchmarking and other research of both Swedish and international PWS options was made.

The different analyses were performed in the same manner. The recordings from interviews were re-listened and the notes were re-read. Keywords and important sentences from these interviews were documented in order to identify trends and patterns. These are presented in the outcome.

These identified patterns resulted in three main findings and a list of user demands. The findings are presented in the outcome. Once the list was finished, the most important demands were determined, based on what had emerged often, and stressed as important, by different stakeholders during the interviews (see table 6.1).

To be able to select a suitable technology for the PWS, each of the three researched PWS options were compared to each demand, and stated in what way the technology responds to the demand (see table 6.2).

The technological possibilities were evaluated through a table inspired by a PUGH matrix[48]. The current SMS solution was set as a base with the score 0. An app and a CB solution received either +1 or -1 if the solution was believed to perform better or worse than the 0 alternative, and 0 if they were believed to perform equal to the SMS solution. (see table 6.3)

[48] 'Pugh Matrix Step By Step' (*decision-making-confidence.com*, 2019) <https://www.decision-making-confidence.com/pugh-matrix.html> accessed 6 January 2019

6.3. Outcome

Below, all outcomes of defining the demands are presented.

6.3.1. Main Factors

The main factors that are deemed to be the most important to the public is **severity** of a situation, **level of urgency**, and **proximity** to the event/situation a person is.

Distributing information on a hyperlocal scale is highly dependent on what type of situation it is, how the situation affects the public, as well as the perceived effects or impact that the public expects that the different situations to have on them. The **severity** of a situation will therefore be in close relation as to how a person perceives information as relevant. Relevant information for an end-user is information which is experienced as affecting them to some extent.

Time is a factor that has to be taken into consideration along with severity. Information about a situation which is no longer happening or causing issues for the receiver of the information, will not be considered as relevant. Therefore, for the information to be of use, it needs to be delivered *in time* to the recipients. *In time* is dependent on what has happened, and how urgent it is for a person to take part of the information. Some situations requires the persons attention immediately, while other situations can wait until the user has finished whatever s/he is doing or chooses to take part of the information. Therefore, **level of urgency** is dependent on how the information is presented, what the recommended action is, and how relevant it is to the user at the time of receiving it. Level of urgency can be compared to “the rate of being notified”, or how disturbed should a person be in their daily activities to take part of information.

Proximity to an emergency situation depends on how severe a situation is, or how severe it appears to be by the user. People seem to care to a larger extent about situations that occur in their immediate proximity. This is believed to be explained by a higher likelihood of being affected by crises occurring in a close proximity. The closer a person is to a crisis or a situation, the higher is the desire to receive information about the situation to a higher extent and at a higher level of urgency. The threshold for what is experienced as a crisis is also lower the closer the users are to a situation, and higher the further away the situation occurs. Users perceive it as more relevant to receive information about the nearby surrounding and have a lower tolerance for information about situations that they are not immediately affected by. This is illustrated in figure 6.1.

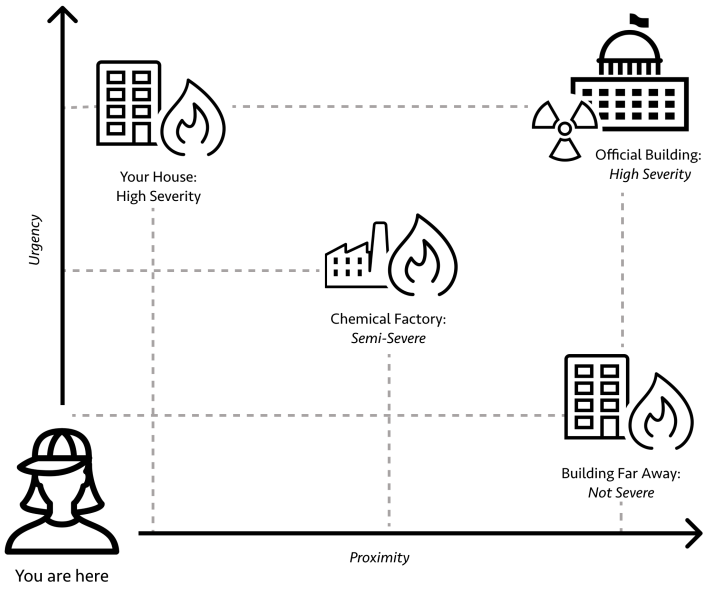

Figure 6.1 displaying how proximity and urgency is believed to be related, from a user perspective.

6.3.2. List of User Demands

The List of User Demands is based on the work described in Part 1 of the report.

Table 6.1 displaying the List of Demands

List of Demands				
No.	Specification	Requirement (R)/ Wish (W)	Most Important Requirements	From section
R1	Work on smartphones	R	x	Literature Study, Survey, User Study
R2	Provide information at a fast pace	R	x	Interviews with Swedish Civil Contingencies Agency, Stakeholders at SOS Alarm
R3	Possible to reach the users, even if the network is congested	R	x	Interviews with Swedish Civil Contingencies Agency, Stakeholders at SOS Alarm, Survey
W1	Being able to find the information again	W		IT department at SOS Alarm
R4	Better coverage than TV and radio (40%)	R	x	Citizens' Media Habits, IT Department at SOS Alarm, Stakeholders at SOS Alarm, MSB
R5	Alert recipients at different urgency levels	R		Workshop
W2	Update the information	W		IT department at SOS Alarm
R6	High data security	R		Survey
R7	Send location-based information	R		User Study, Survey, Stakeholders at SOS Alarm
R8	Information is situation specific	R	x	Stakeholders at SOS Alarm, Workshop
R9	The user experiences to be affected by a situation	R	x	Workshop
R10	Be informed about when the danger is over	R		IT department at SOS Alarm
R11	Receive a required action	R		Workshop, Survey, Stakeholders at SOS Alarm,
R12	Understand the level of urgency	R	x	Workshop, Survey
R13	Understand that the information is sent from an official information source	R		Interviews about CB, Survey, Benchmarking
W3	The message is perceived as trustworthy	W		Stakeholders at SOS, Survey,
R14	No action required to receive the information	R	x	Benchmarking, Survey, Stakeholders at SOS
R15	Be notified of important information	R	x	Workshop, Survey, Benchmarking
R16	Refer to where recipients can find more information	R		Survey, Workshop

6.3.3. Technology Options

The different technology options and how they support the identified user requirements is presented in table 6.2. Their technical specifications are based on both the benchmarking, literature study and also interviews from part 1. The evaluation of the technological possibilities presents the facts on how they respond to each user requirement.

Table 6.2 presents the different PWS technologies investigated, and how these respond to the user demands.

Evaluation of Technology				
No.	Specification	SMS	Cell Broadcast	App
R1	Work on smartphones	Yes	Yes	Yes
R2	Provide the information at a fast pace	Yes, if the network is not congested or there are not too many intended recipients (200 SMS/s)	Yes, always	Yes, if connected to the internet and the network is not congested
R3	Possible to reach users, even if the network is congested	No	Yes	No
W1	Being able to find the information again	Yes	Depends on the phone vendor	Depends on the developers
R4	Better coverage than TV and radio (40%)	Yes	Yes	Not, according to statistics for apps in PWS
R5	Alert recipients at different urgency levels	No	Yes	Depends on the developers, however, follows the sound setting on mobile phone
W2	Update the information	Will be implemented	Will be launched in 2019	Yes
R6	High data security	No	Yes	Higher than SMS, lower than CB
R7	Send location-based information	Yes	Yes	Yes
R8	The information is situation specific	Yes, if the phone number is known	Yes, if user is located within the broadcast area	Yes, if positioning is activated on the smartphone
R9	Recipient experiences to be affected by a situation	Depends on how message is sent	Depends on how message is sent	Depends on how the message is sent
R10	Be informed about when the danger is over	Yes, could send out to the same recipients and the same area	Could send out to the same area, if users is not within the cell they will not receive information	Yes
R11	Receive a required action	Depends on content	Depends on content	Depends on content
R12	Understand the level of urgency	Can be communicated through the message content	Can be communicated through message content, specific sound and vibration. Can override the sound settings on the phone	Can be communicated through sound, vibration, and content

Evaluation of Technology (Continued from previous page)				
No.	Specification	SMS	Cell Broadcast	App
R13	Understand that the information is sent from an official information source	Possible. SMS can however be faked	Possible, if the user is informed beforehand	Yes, if sent through an app the users have downloaded themselves
W3	The message is perceived as trustworthy	Possible, and it can be perceived as spam	Yes, if user is informed about what CB is	Yes
R14	No action required to receive the information	Yes	Yes	No, an app needs to be downloaded
R15	Always be notified of important information	Yes, if phone has the sound turned on	Yes	Yes, if phone has the sound turned on
W4	Ensure a source where recipients can find more information	Possible to achieve	Possible to achieve	Possible to achieve
R16	Refer to where recipients can find more information	Yes, through the message content	Yes, through the message content	Yes, through the message content

Table 6.3 presents the factors for the technology evaluation, and how each possible technology responds to it

Evaluation				
No.	Specification	SMS	Cell Broadcast	App
R1	Work on smartphones	0	0	0
R2	Provide the information at a fast pace	0	1	0
R3	Possible to reach the users, even if the network is congested	0	1	0
W1	Being able to find the information again	0	-1	0
R4	Better coverage than TV and radio (40%)	0	0	-1
R5	Alert recipients at different urgency levels	0	1	1
W2	Update the information	0	1	1
R6	High data security	0	1	1
R7	Send location-based information	0	0	0
R8	The information is situation specific	0	0	0
R9	Recipient experiences to be affected by the situation	0	0	0
R10	Be informed about when the danger is over	0	-1	0
R11	Receive a required action	0	0	0
R12	Understand the level of urgency	0	1	1
R13	Understand that the information is sent from an official information source	0	1	1
W3	The message is perceived as trustworthy	0	1	1
R14	No action required to receive the information	0	0	-1
R15	Always be notified of important information	0	1	0
W4	Ensure a source where recipients can find more information	0	0	0
R16	Refer to where recipients can find more information	0	0	0
	Score	**0**	**7**	**4**

According to the score from the Pugh matrix both CB and an app would respond to the requirements and wishes to a larger extent than an SMS solution would. SMS is considered to fulfil 6 out of the 9 most important requirements, Cell Broadcast 9 out of the 9 and an App scores 5 out of the 9 most important requirements.

Table 6.4 Evaluating the technological solutions to the most important requirements

Evaluation: Most important Requirements					
No.	Specification	Most Important Requirements	SMS	Cell Broadcast	App
R1	Work on smartphones	x	x	x	x
R2	Provide the information at a fast pace	x	x	x	x
R3	Possible to reach users, even if the network is congested	x	-	x	-
R4	Better coverage than TV and radio (40%)	x	x	x	-
R8	The information is situation specific	x	x	x	x
R9	Recipient experiences to be affected by the situation	x	x	x	x
R12	Understand the level of urgency	x	-	x	x
R14	No action required to receive the information	x	x	x	-
R15	Be notified of important information	x	-	x	-
	Number	**9 in total**	**6/9**	**9/9**	**5/9**

When comparing the technologies, all three solutions would fulfil parts of the demands to the extent that it could be an acceptable digital PWS. Both the literature study and the user research showed that the part of the public that is most used to using digital media are the most difficult to reach with the current warning system. This as they rely on finding information through internet services, either streaming radio through an app or searching for information online. However, people stated that an app would be desirable for receiving important information, a rather low percentage (around 8%) has MSB's app Krisinformation. Research in other countries has shown that the number of downloads is low where an app has been released. Therefore, selecting to develop an application for phones to distribute information to the public about crises and situations is not likely to be the most effective means of communication of information to all citizens.

Regarding SMS as a PWS, as currently used in Sweden, it fulfils many of the identified demands. An SMS message is very similar to how CB presents information to users of smartphones. However, SMS does not provide the possibility to alert the public as quickly and urgent as CB allows for. Therefore, SMS could be suitable if information does not require to be delivered at a high level of urgency.

Cell Broadcast responds best to the most important requirements and can therefore be considered as the preferred solution for a PWS in Sweden.

6.4. Evaluation

The main factors for the public to receive information relevant for them is the proximity to a situation, the level of urgency the information is communicated to them and the severity, either perceived or actual, of a situation. As these factors varies, the solution should be flexible to accommodate all different types of situations.

The list of the user requirements is based on the methods presented in Part 1. Therefore, the list of demands may miss some aspects, which this project has not discovered during the research phase. The requirements considered as the most important ones are based on the research, this rating may also miss some aspects. However, the results are based on both experts and the publics wishes and needs and are therefore considered to fulfil the aim of the thesis and be sufficient to base both the list of requirements and the requirements ranking on.

The full PUGH method was not used due to difficulties to compare the three technological solutions could fulfil the different demands better (+1) or much better (+2)/worse (-1) or much worse (-2). Therefore, the decision was made to rank the demands in term of only better or worse.

Cell Broadcast seems to be the most suitable technology to provide the desired service for the public. This is in line with what has been discovered earlier as well.

7. Idea Generation

In this section, the idea generation phase is presented. It includes the description of the methods used to generate ideas, the outcome of the methods as well as an evaluation of the ideas.

7.1. Aim

The concept development phased aimed to explore how different ideas could be developed and combined into concepts.

7.2. Method

The ideation was based on the three main factors; *Severity, Proximity,* and *Urgency.* Ideas for information distribution were generated, through Brainstorming[49] and Brainwriting[50].

The first step was a **brainstorming** session. This was based on the three main factors and how these could be communicated to the public. The time interval for each factor was set to 60 seconds, and all ideas were written down on post-it notes.

The second step to generate concepts was brainwriting based on the outcome of the brainstorming session. Six ideas were selected and written down on an A3 paper. A time of three minutes to work on each idea was set. After the three minutes had passed, the papers were swapped to the other person and the timer was reset to three minutes to continue working on the ideas. The process was repeated until all six ideas had been worked on. This resulted in 6 ideas, and these are presented in the outcome

Even though CB technology is the technical solution that appear to support the user demands in the best way, ideation regarding usage of SMS and an app in combination were also drafted to ensure that a broad spectrum of ideas and concept were considered. The evaluation was done through comparing all solutions to the list of demands, and giving them a score from 0 - 5 as to how well the demand is fulfilled by each solution. (The evaluation can be found in Appendix X.)

7.3. Outcome

The ideas are presented one by one, and are named with a number and a short name, to distinguish the different ideas from each other.

Idea 1: Combining CB with SMS. For this idea, emergency information from non-urgent information which would be nice to know was focused on. Emergency information was imagined to be sent out through CB to everyone located in an emergency zone. Information nice to know would be sent out through SMS to everyone registered at a specific address affected by the emergency.

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[49] 'Brainstorming' (Mindtools.com, 2019) <https://www.mindtools.com/brainstm.html> accessed 7 January 2019

[50] 'Brainwriting' (Mindtools.com, 2019) <https://www.mindtools.com/pages/article/newCT_86.htm> accessed 7 January 2019

Idea 2: App. Developing an app would answer to severatur, as it offers the public to tailor what kind of information they receive. The idea builds on the thought of sending out emergency alerts through the app, but also information for certain areas the user has chosen. Similar to the Krisinformation app MSB has published, but using different zones depending on how close to the emergency the person is.

Idea 3: CB/SMS/App Messages with Zones. The idea is based on using any of the technology possible and using zones to distribute information. The concept is based on the idea of spreading information in different zones, depending on the severity of a situation. For example:

- 1 zone: If the situation is considered to be mild, such as water contamination like E-coli, the information should be sent out to one zone.
- 2 zones: if it's an extremely severe situation (such as military invasion) the whole country should receive the same information, except for the part in closest proximity to the situation.
- 3 zones: If the situation is mid severe, such as a large fire, three zones would be used. The inner zone would be for evacuation, the second zone for closing vents, and outer zone for reducing eventual miscalls and searching for information when seeing a smoke pillar in the distance. Here, the idea was to find a structure for how to classify each situation and set up specific guidelines for each situation.

Idea 4: One Zone. This idea is a hyperlocal version of how it works today, where one type of message is distributed but here it would be on a local scale, i.e the affected zone. This concept is not specified to a certain type of technology but could work for all three discussed options.

Idea 5: Building Specific. This idea was imagined to work for specific buildings, only distributing information to a specific address or street. This concept is not specified to a certain type of technology, as the identified technology currently are too coarse to work. Therefore, this concept is more of an idea of how it could work in the future, or if different technology were investigated.

Idea 6: App with All Information Reported. Here, the idea is to use information as soon as 112 operators have documented the situation. This meaning sending out a constant flow of information to an app where active crisis is. Another function would be letting the users themselves report situations, which could be distributed to other users, aiming to create a community-feeling like social media.

Alert Levels: Alert Levels can be combined with all of the other ideas. The idea is to alert recipients in different ways depending on the Level of Urgency, and divide these into three different levels where the users is alerted different intensity. At the highest alert level, calling this Level 1, users should not be able to miss information and will be notified until it has been confirmed that they have taken part of the information. This concerns events that have the most severe consequences for the user. At Level 2, the user can be alerted once. This implies situations that are not pressing immediately for the recipients attention, but is important enough to notify about and bring to the recipients attention. Situations at alert level 3 might not be threatening to a person's life but are still of relevance. The information should be available as soon as the user is ready to receive/take in information from their

phone, but should not be notified in a way that does not comply with the sound/vibration or other settings on the phone already.

7.4. Evaluation of Ideas

Based on the evaluation, all ideas fit within the solution space. Therefore, when compared to the list of demands, all ideas ranked high. The highest ranking ones were *Idea 1: Combing CB and SMS*, and *Idea 3: CB/SMS/App Message with Zones*. (The complete list of evaluation can be found in Appendix X.)

Idea 1: Combining CB and SMS requires two softwares (given how the current programs work) which could work but requires SOS Alarm to invest in one additional software to be able to use the concept. It would be desirable to send out information the public perceives as “nice to know”. However, this is not a requirement as the information is deemed to not fully classify as applicable for the user at the given time.

Idea 2: App is as explained like MSB:s *Krisinformation*, and as MSB is also part of the alert chain in Sweden, it would be a welcome addition to add zones in their app. Therefore, *Idea 2* will not be further developed, as this could be conducted by MSB instead.

Idea 3: CB/SMS/App message with zones was deemed to meet the three factors well, depending on what technology is being used. If usage of an app, the same arguments for *Idea 2* is applicable and will, therefore, be discarded. Usage of SMS or CB would be interesting to develop further. The indication of the number of zones might need to be more flexible, to be appropriate in different types of crises.

Idea 4: One Zone. This concept could be further developed, in combination with *Idea 3.* However, the only use of only one zone will probably not decrease the number of unnecessary calls to 112.

Idea 5: Building Specific was discarded as it requires a different type of technology than what lies within the scope of this thesis project.

Idea 6: App with all information reported. This concept focuses on letting the public be part of sending out alerts to others. The idea bases on social media, and there is a risk of information fatigue as the information in the app would not be tailored for the receivers. However, even though this issue could be taken care of, it is considered to be outside of the scope of the thesis.

Table 7.1 Displaying the strength and weaknesses of the ideas

Summary of deas		
Summary of Strength and Weaknesses with Ideas		
No. Idea	**Strength**	**Weakness**
1. Combining CB and SMS	Can use existing system for low priority messages. Use CB and set a high priority on more severe events	Requires two different softwares.
2. App	Most personal. Possible for user to customize and tailor to specific needs	Requires that the user knows about this application and actively downloads it
3. CB/SMS/App message with zones	Can be tailored to suit each required action from the user. More flexible	Requires more from people administratives the service
4. One Zone	Same information to everyone	Same information to everyone
5. Building Specific	Tailored specific for inhabitants of each building	Sets high demands on adminstration from senders. Time consuming to create messages for each building
6. App with all information reported	Using the collected knowledge of people in area of situation	Requires that the user knows about this application, uses it, and actively downloads it. Outside of scope

7.5. Formation of a Concept

In this phase, elements from each ideas where combined into one concept of a service. The idea that meet the users demands is idea 3, which offers into a flexible and dynamic system. This idea was further investigated, keeping an open mind to not use fixed zone sizes, as all crises are different. The information sent out will hopefully be relevant and presented with appropriate urgency depending on how severe a situation is. Sending out information to different zones, depending on the proximity to the situation, and with different messages sent depending upon different urgency are deemed as the most beneficial solution. This results in the continued development of zones and urgency levels of a sent message.

8. Concept Evaluation

During the concept evaluation phase, several aspects were evaluated to ensure that the solution will solve the identified requirements. Aspects such as how the different technology options are perceived by the users, and their experiences of receiving different types of information, and also users' experiences of receiving warning messages were examined.

8.1. Interviews regarding SMS, APP & CB

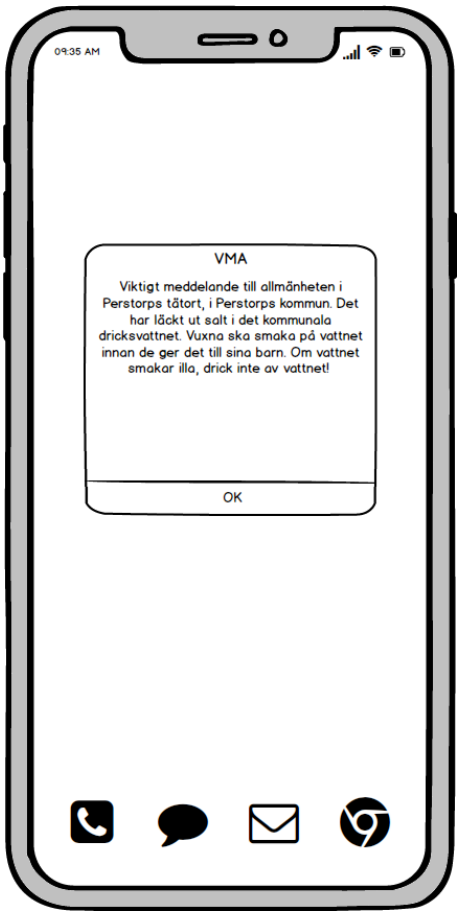
In this section, the results from interviews regarding people's experiences of receiving important messages are presented.

8.1.1. Aim

The aim of the interviews was to acquire information on people's perception of current ways to receive important messages, and how they previously have received IPA:s. Furthermore, how the interviewees would desire to receive important messages was investigated.

8.1.2. Method

Three persons, 1 man and 2 women aged between 22 and 31, had volunteered to be interviewed regarding important message to the public.



The interviews were semi-structured to structured in character. Each interview, which lasted around 30 minutes, was recorded and additional notes were taken along the course of the interview.

First, the background information on the interviewee's phone usage, media habits, and interest in the news, were investigated.

Different digital solutions, suitable to use in a PWS, were discussed to gain the participants' opinions regarding receiving information to their phone. The interviewees' experiences of IPAs, both in Sweden and abroad were also investigated. SMS and applications were compared and discussed as potential usage in a PWS. Here, questions regarding how they would experience the two different technologies were posed. Lastly, the interview focused on CB to understand what the interview intervieees' initial concerns were when introduced to this technology. An illustration of the solution was presented on paper (Figure 8.1). This prototype served as a mediating object as none of the participants had experience of receiving a CB message. The text used for the message was the same as the IPA issued on October 11th 2018. (The interview guide can be found in Appendix IX.)

Figure 8.1 displaying the prototype used in during the interviews

8.1.3. Outcome

When it comes to the interviewees' media habits and technology use, the interviews revealed that they rarely had sound activated on their phone. They usually streamed media and were rarely using traditional media such as TV or radio.

It was found that SMS messages are, in general, associated with an advertisement. However, it was considered favorable not having to download anything, which is necessary for an app, and the interviewees stated that SMS appears to be a reliable solution in a crisis. However, they might not press any link inside a text message as they were afraid that the SMS is a scam.

Out of the three proposed solutions, an application (app) is the one that feels most personal and official, as the users have to download the app themselves. However, as to find and install the app is associated with extra efforts, one of the interviewees said that she would probably have to be “pushed” to do so. The concept of an “app-fatigue” also came up during the interviews, and one interviewee exclaimed: “Oh, not another app”, while still perceiving it as a personal and official way of communication.

CB was a hypothetical solution for the participants and therefore harder to relate to. The interviewees stated that it was good not having to install anything to receive information. They perceived CB as a path between an app and an SMS. Nevertheless, unless the technology would be introduced through campaigning, the interviewees would most likely not understand what a CB message is if receiving one. If no campaigning would be performed beforehand, they would most likely consider the message as spam or a virus on their phones. The participants would accept to receive a CB message, if they knew beforehand it could be sent to their phone in that manner.

8.1.4. Evaluation

The interviewees’ media habits appeared to be in line with the characteristics of a highly digital user. Therefore, the input from these interviews is likely to be positive towards any digital solution, and towards new technology, rather than prefer an analoge solution.

The idea of information being distributed in case of an emergency to one’s phone without having to perform an action was considered positive. This was because the information was judged as accessible for everyone. The interviewees experienced a reduced risk of missing important information if they were to receive information digitally, especially if the service was to override sound- and vibration settings (as CB can do). Therefore, both SMS messages and CB were considered as promising options to receive information. It was also clear that the interviewees perceived it as important to ensure that the public is informed about the implementation of CB before it is introduced. This so that there would be no confusion regarding what a CB message is as soon as it is delivered to all phones in an area.

All interviewees would install an app if they were asked to do so – but expressed that they would need to be reminded of it. The survey conducted in this thesis project (chapter 3.5) showed that people will in general search the internet to find information about crisis situations, and low usage of the app *Krisinformation*. Therefore, these results are not surprising..

8.2. Focus Group

In this section, the results from further evaluations of the concept are presented. In this case, a focus group was conducted in which an evaluation of different zones and urgency levels were tested.

8.2.1. Aim

The aim of the focus group was to analyze and evaluate the user experience of the concept, with focus on the zones, alert levels and to some extent also the content. Furthermore, to receive more insights regarding the chosen technology, the aim was to compare cell broadcast to an SMS or an app.

8.2.2. Process

The participants in this workshop were five persons, 1 man and 4 women, aged between 24 and 55 years. The workshop took place at a conference center in Stockholm, Sweden. All participants were inhabitants of and familiar with the city.

As a first step, a short presentation of the thesis project and the purpose of the focus group was provided in order for participants to understand why their contribution mattered, and what they were going to do during the 1.5-hour session.

As a warm-up exercise, the participants were asked to participate in a check-in. They were asked to say their name and if they usually have the sound on or off on their phone.

As a warm-up exercise, the participants were asked to participate in a ‘check-in’, i.e. they were asked to say their name and if they usually have the sound on or off on their phone. As their first task, they were then asked to discuss different use of the three technologies. The participants were given one piece of paper each (see figure 8.2), describing how the different technologies worked and how these could be used for a public warning system. They were asked to read the descriptions and to discuss how they perceived the technologies. Furthermore, they were asked to express how they would feel receiving information in the different ways to their phones.

TEKNISKA ALTERNATIV

Jämför de tre olika teknikerna: SMS, Cell broadcast (automatiskt till din telefon) och App
1. Var känns mest officiellt?
2. Vad känns mest personligt (alltså, specifikt skickat till dig)
3. Vad skulle du föredra?
4. Vad skulle du inte föredra?

SMS	Cell Broadcast	App
Ingen nedladdning krävs	**Ingen** nedladdning krävs	Nedladdning **krävs**
Textmeddelande som kan nå alla	**Textmeddelande** som når alla i en zon	**Textmeddelande** som når de som har appen och notifiktationer påslagna
Kräver **täckning**	Kräver **täckning**	Kräver **täckning och internetuppkoppling**
Adress- och positionsbaserat	**Positionsbaserat**	Både **positionsbaserat** och **förvalda områden** användaren vill ha information om
Låter som ett vanligt SMS, låter endast om ljudet är påslaget på mobilen	Särskild signal, låter även om ljudet är avstängt på mobilen	Går att anpassa, låter endast om ljudet är påslaget på mobilen
Relativt anonymt, informationen är endast tillgänglig för SOS Alarm vid nödläge	Helt anonymt	Inte anonymt
Hur **snabbt** meddelandet kommer fram beror på hur mycket **andra** använder telefonnätet samtidigt	Hur **snabbt** meddelandet kommer fram beror **inte** på hur många **andra** som använder telefonnätet samtidigt	Hur **snabbt** meddelandet kommer fram beror på hur mycket **andra** använder telefonnätet

Figure 8.2 presenting the different technological alternatives that were presented to the participant

However, the intended purpose of this task was not the outcome of the discussion, rather this task was designed as a ‘smokescreen’ for the actual task – to investigate how participants experienced being interrupted by information. Therefore, in the middle of the discussion, they were interrupted by different “important message” written on a piece of paper handed to each participant. Each message was presented inside a sketched mobile phone (see figure 8.3). Altogether three different scenarios at different level of urgencies (called Alert Levels). Each message had a unique combination of a Zone and an Alert Level, related to a scenario. The messages are presented below:

- E-coli in the water (Alert Level 3: Zone 1)
- A large explosion (Alert Level 1: Zone 1, and Alert Level 2: Zone 2)
- Fire with heavy smoke (Alert Level 1: Zone 1, and Alert Level 2: Zone 2).

There were one message of each type, so all participants received different messages. The messages were distributed at random to the focus group participants. After reading the ‘important message’, the participants were asked to fill in a short questionnaire individually.

In the third task, the participants were asked to tell the others what message they had received and at what level of urgency they received the message. Further, they were given a piece of paper with questions to discuss and were asked to talk about the different messages they received. The questions regarded how they were interrupted by the ‘important message’, how they were notified in the different zones and what scenario they had been informed about. Lastly, they were asked to discuss what type of technology would be favorable in each of the scenarios.

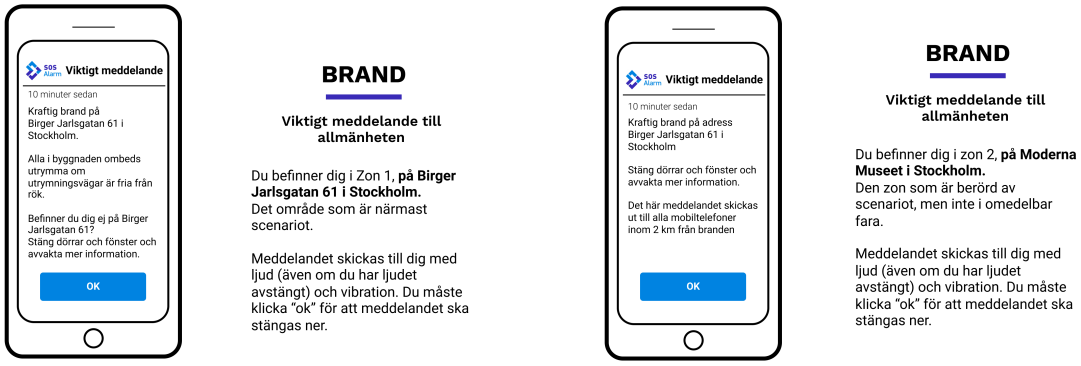


Figure 8.3 displaying one of the scenarios that were presented to the participants of the focus group

8.2.3. Outcome

The individual responses from being interrupted by "important messages" during group discussions were very uniform. The two persons receiving a message at Alert Level 1 stated that the message felt very relevant, and the three others "further away" from the crisis stated that it felt somewhat relevant. The content of the messages was perceived as too long, and the participants stated that the messages could be shortened – it was too much information to process.

When moving to the more general discussion regarding all scenarios and how close to or far away the participants were from the scenario, the opinions differed. One participant stated that "If I cannot do something about it, then I don't care if there is something happening in the other side of town" whereas another explained that "I want to know everything if someone deems this as important for me and my safety".

Everyone had a different opinion as to how much information they wished to receive about situations and crises that happen in society. All participants had their own view as to how much faith they had in authorities deciding how often and in what way they could be reached. A conclusion was that if they were close to a scenario, the expectations were that they should receive information and that the state or another administrative authority should provide it.

When discussing technology options, opinions were that SMS is perceived as an advertisement and that it is easy to ignore. The participants further stated that they do not have the sound activated on their phones, and this makes it easy to miss a message of importance. However, the participants concluded that SMS is a working solution and it is a better alternative than not receiving any information at all. It is, for example, likely that they would miss information entirely if they would have to perform several actions to find it. The participants stated that they would download an app if asked to, and liked the idea of being able to customize what information they receive and in what areas. However, one participant

said: “I really don’t want another app, and I would probably delete it after a while”. None of the participants used the app *Krisinformation* or knew of its existence.

CB technology was unfamiliar to the majority of the participants and was, therefore, more difficult to discuss. The focus group participants stated that it was appealing to receive information without performing an action, and also to be notified with a sound if the message is important even though mute was activated on the phone. Some of the participants stated that they ‘felt seen’ when they had to press ‘OK’ after reading the message, and one participant said that “It feels like I am seen and cared for when I have to confirm that I have read it”. Another participant declared that: “I don’t have a TV, so I will not be reached by the official channels”. Another one stated that: It all comes down to the issue of what we are expecting that the government should provide us with, and what is one’s own responsibility.”

However, it was declared that it is important that information sent to phones must affect the receivers of the information in some way. A message about something far away, that is not severe, would likely be regarded as spam and be considered as annoying..

8.2.4. Evaluation

This focus group was initially planned as a workshop with more participants, but due to last minute cancellations it had to become a focus group given that only 5 participants showed up. Therefore, the execution of the study was not as desired. However, the focus group fulfilled the aim initially set for the workshop to some extent.

As the intended discussion was meant to follow a different structure, the outcome was hypothetical discussions regarding scenarios. The focus group did not provide new insights regarding the content of the messages, as the participants were few and not from the intended target groups. Still, even if the study would have been a workshop - as intended - the information would still be provided on paper, not on mobile phones and not while being affected by a crisis. The discussions regarding the information received were still interesting, although they did not meet the intended aim of discussing the zones and alert levels in specific groups. From the discussions, it is possible to say is that there is, in general, a trust in the government providing information to the public. By having to push “ok” to confirm that the message had been read provided a sense of comfort and “being seen”.

Another observation is the issue of *perceived* and *real* threat really had an impact on the results. It was apparent that some participants did not understand that smoke from fires pose a greater threat, and can be harder to avoid than e.g. a shooting and terror attack. This is may be because the perceived threat is greater for the latter two. Perhaps this sets a demand on authorities to communicate why something is dangerous as a complement to required actions in order for the public to understand threats properly. However, this is a discussion between what is ‘nice’ to know, and what is absolutely necessary to reduce the amount of information to be processed, as well as what is one’s own responsibility vs someone else’s.

During discussions, participants said that they would like to have the same possibilities as an application provides, but there is little incentive to find information. There is an apparent expectation that authorities should inform if there is something important happening and that there is a lot of faith in a working informational system. In an ideal world, participants

should receive information that suits them, without risk of missing out. Opinions expressing app fatigue were also observed.

The fact that all participants were placed in one group had most likely a great impact on the group dynamics and also the outcome. A few were more comfortable talking in front of the others, and some were more introvert in a large group. The majority of the participants knew each other previously, which also was apparent in the group discussions in the way they talked to each other and behaved. An example is that some of the participants changed their opinion during discussions. This does not necessarily have a negative impact on results, but some caution when interpreting these results is urged.

It is possible that this focus group was too structured, using written notes and bulleted lists about subjects to discuss. To facilitate discussions, the amount of information provided in this very short time could have been less, this so that the discussion could be more focused on a few things. In hindsight, it would have worked better if some tasks and discussions would have been removed as soon as the workshop had to be transformed into a focus group.

9. Possibilities for SOS Alarm's Organization

The next phase was conducted to assess the possibilities to implement the concept into the SOS Alarm organization using a top down approach. In this chapter, the system within SOS Alarm for handling an IMP request will be mapped out and workshops and interviews with stakeholders to investigate the feasibility of the concept will be presented.

9.1. Use Case

As a reference use case for this part of the development process, the case *fire in a building* was selected, more specifically a fire in an apartment building where there are visible flames and lots of thick smoke that is toxic to inhale, to showcase the severity of the event. This use case was selected because it is a common emergency situation in Sweden. According to statistics from the Swedish Civil Contingencies Agencies, there were 29 rescue missions performed each day on average in 2017.[51] A fire was also the most common crisis reported as an IMP in 2017[52]. This use case was used as a reference when discussing with stakeholders about the potential implementation of a concept to ensure that all involved are thinking about the same type of situation with the same conditions.

[51] 'Brand I Byggnad' (*Ida.msb.se*, 2018) <https://ida.msb.se/ida2#page=a0224> accessed 20 November 2018.

[52] 'Alla VMA 2017' (Msbgis.maps.arcgis.com, 2018) <https://msbgis.maps.arcgis.com/apps/MapJournal/index.html?appid=e5249ecbfc1a4dc5bbe7ba42190ea582> accessed 20 December 2018.

9.2. System map

The system map describes the flow of information, within the system boundary. The system map starts from ‘Crisis’ and follows the arrows to the next step. The system map and its course of actions are based on the selected use case *Fire in a building*. The situation is based on when an IPA is distributed to the public, through an SMS by SOS Alarm as well as broadcasted on national TV and radio.

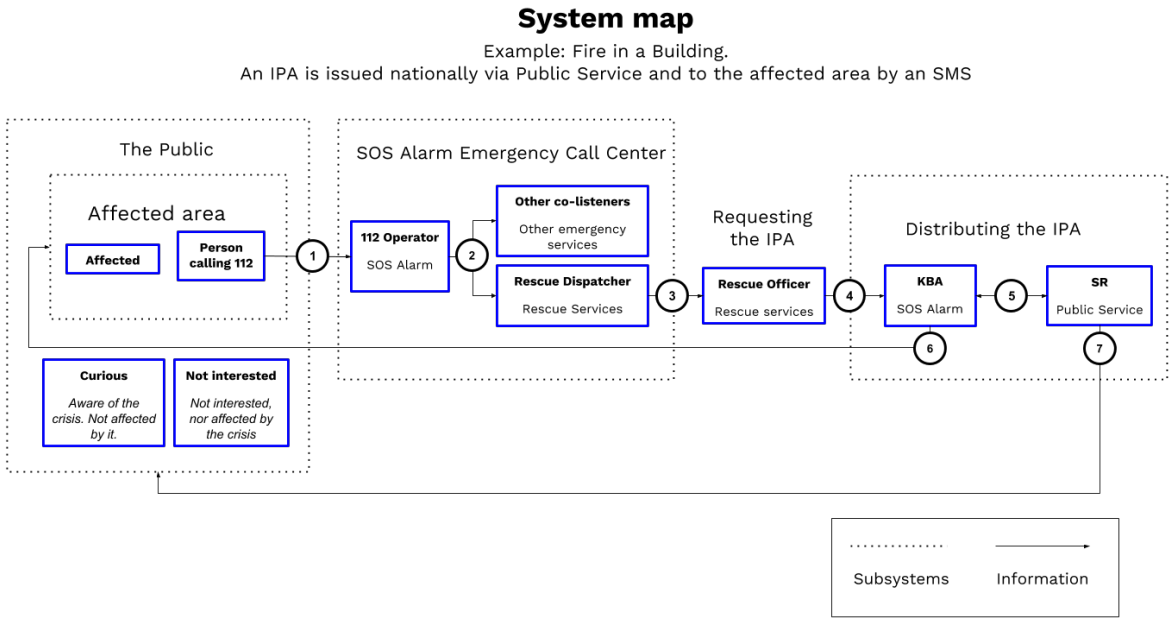


Figure 9.1 displaying the System Map

The flow of information within SOS Alarms organization starts with a phone call received by the 112 operators. (1). This call reaches the 112 operator that identifies that there is a fire, and connects recommended resources such as rescues services or similar entities (2). Once the rescue services are at the scene of the event (3), the rescue officer makes the decision that the event is severe enough to send out an IPA and contacts KBA (4). KBA has in the meantime supervised the chain of events in their computer system *CoordCom,* which is the same system used by 112 operators. This means that KBA has an overview of all reported events that happen in Sweden at any given time. KBA and the rescue officer has a discussion regarding the situation and message to be sent. The final stage of the process before the information reaches the public is that KBA has a discussion with SR regarding the content of the IPA (5). It is also possible that KBA, the Rescue Officer and SR have a three party discussion about the IPA. Then, step 5 is a part of step 4. Finally, KBA distributes the SMS (6), and Public Service broadcasts the message on national television and radio (7). The signalling horns can also be activated by SOS Alarm or the rescue services themselves if this is deemed necessary.

9.3. Second Interview with Crisis Preparedness Officers

In this section, a second interview with KBA is presented. During this interview, the concept was discussed, both as to its potential and as to its implementation.

9.3.1. Aim

The aim of this meeting was to investigate if KBA could be responsible for distributing information to the public, if this could be done at an earlier stage, their view of the concept and the thought of sending out a message in such a way.

9.3.2. Process

A semi-structured interview was undertaken with one experienced KBA operator. The interview took approximately 90 minutes during which digital notes were taken and the interview was recorded. (The interview guide can be found in Appendix XI.)

9.3.3. Outcome

During the interview, it became clear that KBA can usually predict with good accuracy what reported situations will become an IPA request long before the Rescue Officer demands one. This is due to the fact that they continuously surveil all current events in Sweden via CoordCom*,* as well as the domestic and international news. The KBA operator also stated that in a majority of times the Rescue Officers are unsure if the situation can be considered an IPA or not. The rescue officer usually discusses this matter with the Rescue Dispatcher, who conveys the contact between the rescue officer and KBA. This is not the intention, the Rescue Officers should contact KBA immediately when they want to demand an IPA.

Earlier, 112 operators were expected to manage the IPA contact with SR. Each individual 112 operator did not encounter an IPA request often, and therefore it was considered a difficult task for them to manage. KBA was established in 2009, which has improved the quality of IPA:s as fewer people manage IPA events (at present 13 individuals). This also increases the pace of distributing information to the public and provides a higher quality of the content.

Nevertheless, the interviewee states that there is an unclear division of responsibility as well as ownership of message content, between SR and KBA. Therefore, the information distributed via SMS and through public service differs occasionally. Disputes regarding content are not uncommon and cause delays to the distribution.

Other things that were discussed were using the temperature questions as a base for determining if a situation is severe enough to issue an alert message to the public. The operator was open to the idea. When discussing the idea of providing more responsibility to KBA to issue informational messages to the public without having to contact a rescue officer first, the interviewee said that “It should not be up to an individual KBA staff to make that call”, this as KBA sit in their office, and have less insight into the danger at the specific location.

9.3.4. Evaluation

What is interesting is that when KBA was founded, they removed the responsibility of managing the IPA messages from the 112 operators. The reason was that the individual 112 operator faced the situation this seldom, which created uncertainties, delays, and inconsistency in content and events classified as an IPA. This can also be said for rescue officers. Based on the interviews with KBA, 112 operators and the literature study, it has been found that rescue officers are today in a similar situation i.e. not having to manage such messages often. Providing KBA with more mandate to issue messages to the public, and provide them with the support they need to make informed decisions, could possibly increase the pace at which information is distributed. The KBA operator was open to the idea of hyperlocal alert messages, but KBA has a need for support if being in charge of distributing information as they are not at the scene of the situation.

9.4. Workshop with Stakeholders at SOS Alarm

In this section, a workshop with relevant stakeholders from SOS Alarm will be presented.

9.4.1. Aim

The aim of the workshop was to introduce the concept to stakeholders at SOS Alarm, to verify and/or make adjustments the system map, and to investigate how a frontstage concept could be introduced into the organization.

9.4.2. Process

The workshop was inspired by a workshop called SPARK, which is created by Publicis.Sapient. The five participants were SOS service developers, service owners, as well as the chief of KBA and one KBA operator. The workshop lasted for 2,5 hours. Tasks included a thorough investigation of finding the problems with the implementation of a concept, turning these problems into possibilities and ideate to find possible solutions together with the participants.

First and foremost, participants were given a short 15-minute presentation of the findings from the research phase, the frontstage concept, and the purpose of the workshop. As a ‘check-in’, the participants were asked to say their name and to state one fact about themselves based on an item on their respective keychain. The participants were then divided into two groups based on their roles at SOS.

The first task regarded the system map. The task consisted of two parts, where the first being to confirm or reject the map. The second task was to, if the map was not correct, to draw a correct one on A0-sized papers and use post-its as they saw fit. The participants were asked to sit in their groups and discuss during five minutes, and then present their conclusions. Afterward, a predefined challenge was presented to the participants:

‘How can we implement the Hyperlocal Informational Message-Service, into the SOS organization?’

In the second task, participants were asked to state all problems that they could find with implementing this concept. All problems were written down on post-it notes during three minutes and the participants were then asked to discuss the issues within their groups

during seven minutes. Afterward, the participants had 60 seconds to vote, using four dot stickers each, on the problems that they found most pressing. The problem which gained most votes were placed on the so-called reframing board (see figure 9.2). After this was done, the next task was for the participants to write down all reasons as to *why* the problem exists. Each person had three minutes to write down all *whys* they could imagine. Afterward, the participants discussed in their respective groups for seven minutes. Participants were again given 60 seconds to vote on the *why's* that they found most important. They were asked to select the four *whys* with the most votes, and place them on the board.

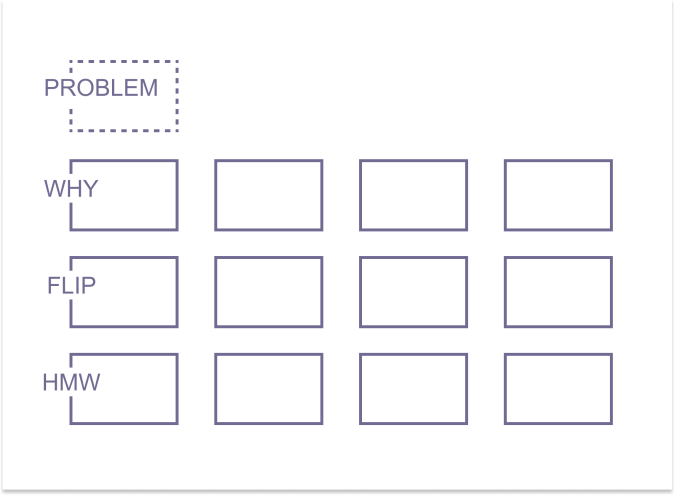


Figure 9.2: Presents a representation of the SPARK Reframing Board

The fourth task was to turn the *why's* into opportunities. Therefore, participants were given 5 minutes to discuss together in their groups what the opposite of each *whys* is. These opposites are called the *flips* and will serve as a base, and spark ideas for reaching a dream scenario, for the fifth task.

The fifth task was to rephrase the *flips* by turning the dream scenario into a “How might we..?”-question (HMW). The groups were given 7 minutes to discuss. The HMW’s were written down on post-its and placed on the reframing board. At this point, the working board was filled. The groups were asked to present to each other.

As the final, and last task of this workshop the participants ideated on the identified *How Might We*. They were given so called *SPARK cards* to facilitate the idea generation process. The cards were divided into two categories, *Technology* and *Channel*, where these cards could be combined to spark ideas. The participants were each given 7 minutes to generate ideas on their HMWs. Furthermore, they were given 3 minutes to discuss and prepare their best ideas for presentation. The groups presented their ideas to each other for 2 minutes each. Afterward, they had to rank their ideas dependent on how much value they would give and how doable they are. Lastly, the participants got to vote on all of the ideas.

As a final part of this workshop, the results were summarized. Some of the participants stayed for a final discussion about cell broadcast and applications. All is documented in the outcome.

9.4.3. Outcome

The participants believed that the system map was correctly formed. Nonetheless, it also became clear that this is not how it is actually always executed. An explanation from KBA was that the rescue officer is not always sure who should be contacted when they wish to issue an IPA. The KBA operator said that when rescue officers call, they usually ask: “Are you the ones that manage the IPA service?”. Some municipalities also start the signaling horns without going through KBA first, which is problematic. KBAs also confirmed what was found in the literature study - that there are many insecurities about how the IPA service should be managed.

The outcome of the discussions are described according to the structure: Problems, Whys, Flips, How Might We, and Ideas.

The *Problems*
Group A: “The information distributed to the public is not flexible enough”
Group B: “There are too many involved in the IPA chain today (MSB, SR, and SOS)”

The *Whys*
Group A:
- “Rules and Regulations”
- “No clear level below the IPA, where you can send provide information”
- “Too many stakeholders involved”
- “Difficult to send information to different target groups in different areas”

Group B:
- “Others can decide in the chain of events”
- “MSB administer the service”
- “Long history and heritage of the IPA. Heavy administration”
- “Who will finance?”

The *Flips*
Group A:
- More open legislation and legal framework, that allows for future flexibility
- It is possible to send SMS messages only, without TV
- One part receives a clear responsibility for coordination of IPA messages
- It is easy to send different types of information with precision, to nearby areas

Group B:
- “SOS has the right to decide”
- “SOS Alarm owns the chain of information”
- “New launch of a new IPA”
- “The state will pay”

The *How Might We*
Group A:
- How might we motivate affected parts/organizations to create more flexible laws and rules?
- How might we distribute targeted information?
- How might we ensure that SOS has a clear coordination responsibility?
- How might we have a higher precision in our distributed messages?

Group B:

- “Affect the state and MSB to make more efficient use of SOS AB”
- “Make sure that 112 and IPA are connected. Clarify this to the state and other stakeholders
- “Communicate together with the state and other actors/stakeholders”
- “Finance through BP20 or BP21”

The *Ideas*

- Be more “modern”, show flow of information, show how SOS Alarm make use of, and handle information
- What if we could affect stakeholders and decision makers through a podcast
- What if we could though a TV-series could show the entire chain from 112 to IPA
- What if we could show the use of a new IPA through AR and distribute this through social media
- What if we could follow an IPA via a map and receive it through a smartphone, IoT, and wearables

What emerged during discussions were that the rescue officers sometimes have trouble explaining the exact area to KBA where the IPA should be issued. When this occurs, it consumes a lot of time and the rescue officers rarely have the time to focus on the IPA message, due to the other tasks that require their attention. During the discussion, it was also stated that SOS believe it is problematic that it is not clearly visible to the state and other stakeholders how 112 and the IPA service are connected. Furthermore, not owning the entire service cause delays and confusion for both SOS Alarm and the public.

9.4.4. Evaluation

This workshop clearly showed that there are deviations between theory and practice with respect to the system map. According to SOS, this is due to confusion and insecurities regarding the rules and process of the IPA chain. The rescue officers are stressed and not confident enough regarding how to issue an IPA. Also, it comes down to opinions regarding what should be communicated or not. A clear possibility is to use KBA as a coordinator for IPA situations and assist rescue officers at an early stage instead of just distributing messages on demand from the rescue officer.

SOS Alarm perceived it as a problem that there are many stakeholders involved in the IMP process. Rules, regulations and an inflexible system with a heavy heritage were also factors that SOS identified as their main issues with regards to the IPA chain.

The workshop as a method for data collection would have benefited from more time than just 2,5 hours. However, there is the trade-off with how much time that can be requested from the company and how much time that is desirable to actually use.

10.Conclusion of Part 2

The concept of communicating different information to different zones, with tailoring of how the message is distributed to the public, is a welcomed solution to improve the IMP chain. Tailoring a system suitable for the needs of the public is possible with the CB technology. The technology enables broadcasting messages at different alert levels depending on the severity of an event. It does not require any effort from users and can reach any smartphone with at least GSM reception. As 80% of the Swedish population has a smartphone, it can be an excellent opportunity to reach a large part of the general public.

There is an opportunity to warn and inform the general public at an earlier stage in case of an event if SOS owns the entire service. This means that there will be no external stakeholders interfering with the process. Supporting KBA with information based on the information collected by 112 operators, KBA is believed to perform well in terms broadcasting of Hyperlocal Alert Messages. Considering their knowledge of current situations in Sweden and experience of communicating with rescue services at the event site they can with decision support, make an informed decision based on what a computer system suggests should be broadcasted.

Part 3: The Service

In this part, the service will be presented. The frontstage solution is the part of the service visible for the users, responding to their needs. The backstage solution is the part of the service that processes the frontstage actions, the organizational processes needed from SOS Alarm to deliver the service.

11. Proposed Solution

11.1. Frontstage Solution

The frontage of the solution is the part visible for the users, meaning the parts of the service the users might interact with. The focus of the frontstage solution is the Hyperlocal Alert Message and how the messages are experiences by the end-users. To create a dynamic system for distribution and receiving of alert messages, the Hyperlocal Alert Message service is divided into *zones, alert levels,* and *content*. This to ensure that relevant information is distributed in an appropriate manner.

11.1.1. Zones

To create a dynamic system for distribution of information, zones will be used to provide relevant information to the affected part of the general public. What relevant information is is based on what information is required for the receiver, as well as what action the user needs to perform after having received the message. The zones will provide the opportunity to tailor information for each part of the public inside each zone. Distributing information to a larger area than to the immediate proximity of a situation could reduce unnecessary calls to 112.

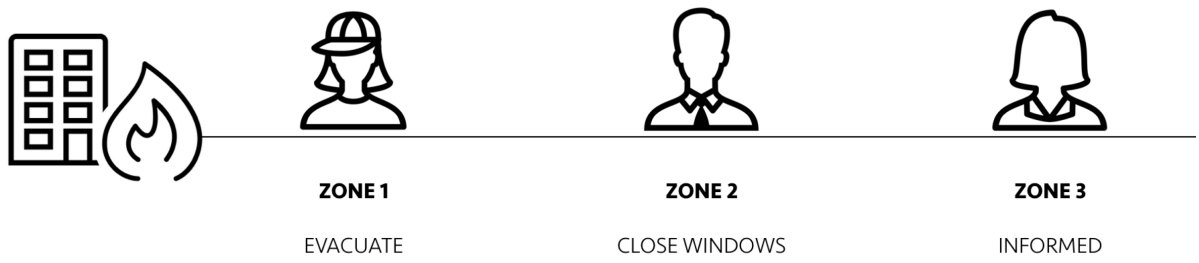


Figure 11.1 presents the three different zones in relation to the situation of a fire

Inner zone/Zone 1. The inner zone requires an immediate action from the user, such as evacuation or similar precautions. The crisis or situation has happened or is currently happening inside this area.

Mid-zone/Zone 2. The second zone, or mid-zone, is the area where danger is present, but not as close and immediate as in zone 1. The people within the zone are to perform some kind of action, such as closing windows and doors.

Outer zone/Zone 3. In zone 3, or outer zone, the recipients are not in danger, but they require or desire information. The message might call for action, however, this depends on how the situation evolves. Users might be encouraged to prepare themselves for a changed situation. Furthermore this zone can serve as an information channel that provides information about situations that will cause a high pressure on the 112-number and cause a high workload on the 112 operators by information seekers.

11.1.2. Alert Levels

Alert levels are designed to assure that the alert message sent out is *disturbing* and *interrupting* the user (the recipients of the message) in a reasonable way. Here, the focus is on whether it is a matter of immediate action or if it is information which is desirable to know. Different levels of alert will distinguish how urgent the information is perceived.

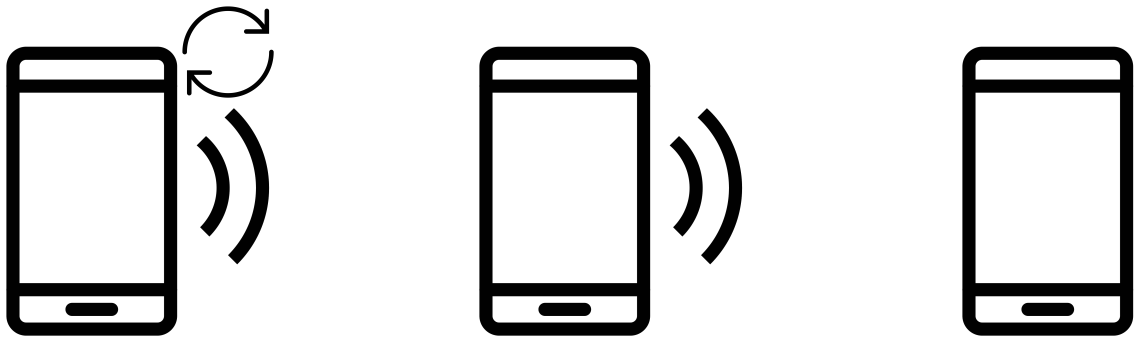


Figure 11.2 displaying the alert levels

Alert level 1. At Alert Level 1, the notification will use sound and vibration, overriding the phone's sound profile if the phone has been muted or its vibration has been turned off. The sound and vibration should be repeated until the user has opened the message. The message should override the screen until the user has confirmed that the message has been read. The message will be present in the notification center without the possibility to remove it while the message is still active.

Alert level 2. At Alert Level 2, the notification will use sound and vibration, overriding the phone's sound profile if the phone has been muted or its vibration has been turned off. The sound is however not repeated, differentiating it from Alert Level 1. The message should override the screen until the user has confirmed that the message has been read. The message will be present in the notification center with the possibility to remove it while the message is still active.

Alert level 3. At Alert level 3, the notification will respect the sound profile of the phone. The message will be present in the notification center for the user to click on when choosing to open the message. The message can be removed from the notification center while being active, meaning that the user can remove the notification from the screen at any time so it's not visible any longer.

11.1.3. Content

Relevant information for the recipients of the message is information which they understand why they receive and which is applicable to them. Therefore, the content broadcasted to the public should follow the following guidelines:

- State what the receivers assumed position is relative to the crisis
- State the severity of the crisis
- State at what time the message was sent
- State if the crisis is still active/ongoing *or* what time it happened
- Describe what the crisis is about
- Describe what the expected action from the user is
- Refer to where more information can be found

11.2. Backstage solution

By backstage is meant how the service is provided to the public by SOS Alarm. The backstage is how the system delivers the Hyperlocal Alert Messages to the public to provide the user experience.

KBA will be responsible for sending the Hyperlocal Alert Messages. The solution will be based on CB technology and the software will support KBA in their work. The decision support in the software will collect information from CoordCom. The software will notify KBA if a situation reported in CoordCom might call for a Hyperlocal Alert Message. The CB software will then retrieve relevant information from the CoordCom software

The backstage solution offers a faster way for SOS Alarm to inform the public of crises, by shifting the responsibility to KBA instead of an expert at the scene of event. KBA can in this manner directly send out a warning by using the information that the 112 operators receive from a caller (see figure 11.3). By informing the recipients of the situation faster, they can be informed of what they should do even before, for example, the rescue services are at the site.

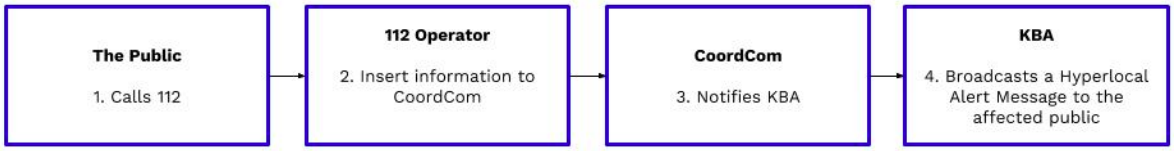


Figure 11.3 displaying the main components of the backstage solution

11.2.1. Service Blueprint

To describe how the frontstage and the backstage interact, a service blueprint was drawn to map out what parts of the frontstage trigger processes and actions at the backstage.[53] The Service Blueprint is presented in Figure 11.4, and also in Appendix XII. Below follows an explanation of the actions required from KBA and the Hyperlocal Alert Message-system in chronological order.

[53] Roberta Tassi, 'Blueprint | Service Design Tools' (*Servicedesigntools.org*, 2018) <http://www.servicedesigntools.org/tools/35> [accessed 12 December 2018.]

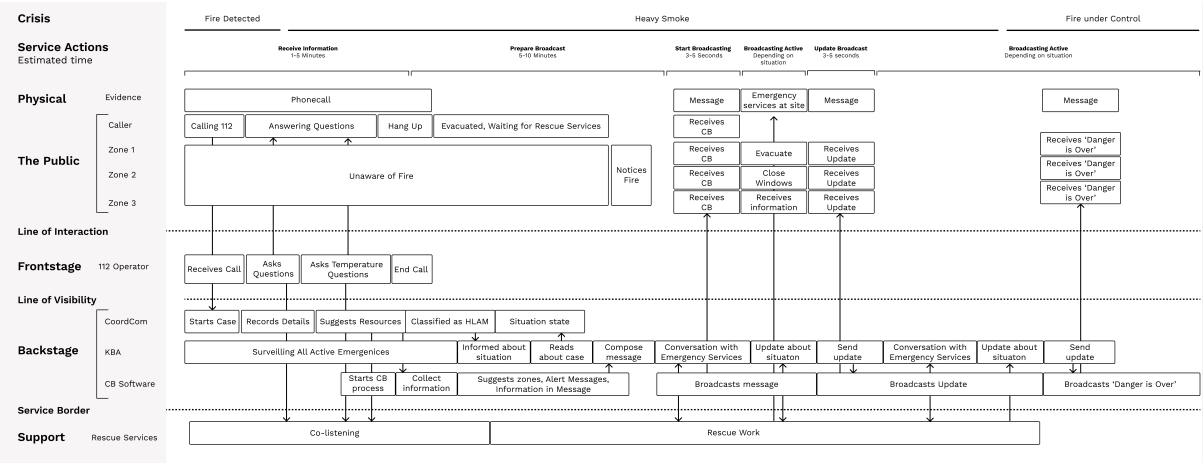


Figure 11.4 The Service Blueprint

From the moment a call reaches an 112 operator, the crisis is registered in CoordCom and is visible for KBA. When the situation has been classified as a potential Hyperlocal Alert Message through the *temperature questions* asked by an 112 operator, a notification should be presented to KBA to inform them about the situation. The Hyperlocal Alert Message system also sends out a notification to the rescue services, to notify them that the situation will be broadcasted. The system retrieves information from CoordCom in order to propose a suggestion of zones, alert levels, and content for KBA to review. Here, KBA should use their expertise and experience to change the suggested broadcast, if they find it necessary. (see figure 11.5)

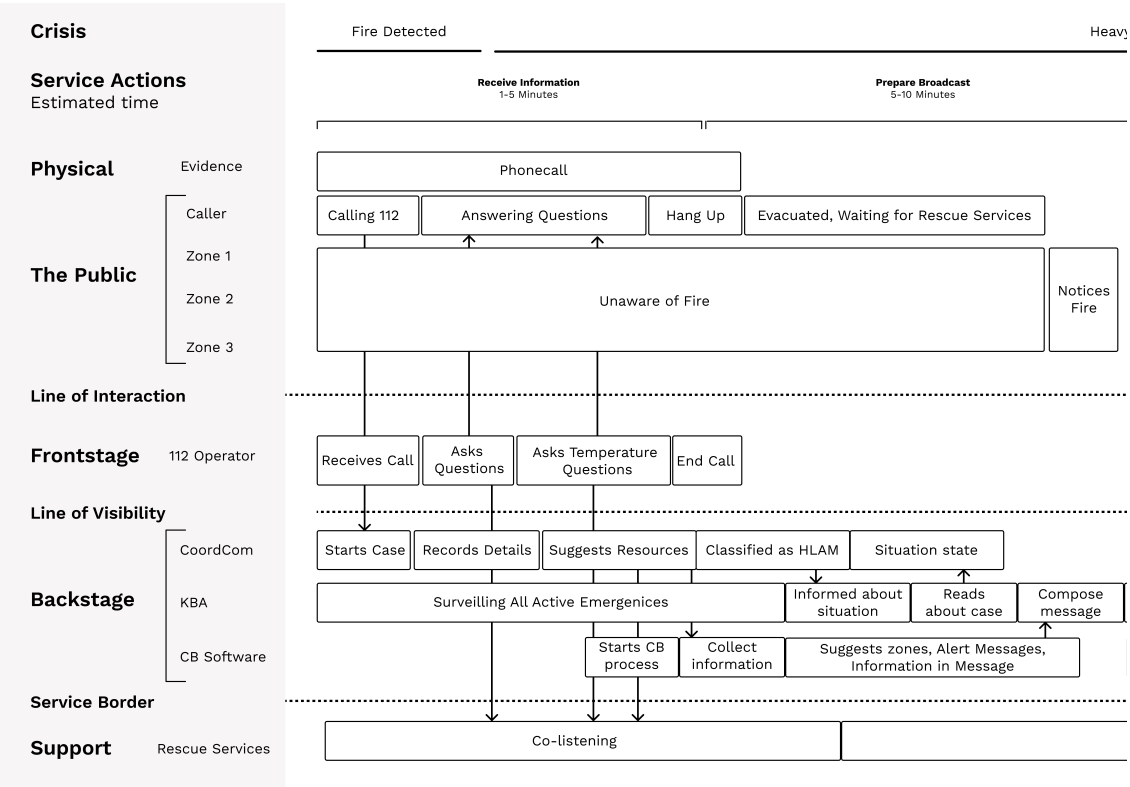


Figure 11.5 The first part of the Service Blueprint

When broadcasting, the messages reach the general public within seconds. During the preparation of a message, or after broadcasting the initial message, KBA should hold a conversation with the rescue services at the site. The message can be updated based on the current condition and the rescue services expertise, to ensure the best possible distribution of information (see figure 11.6)

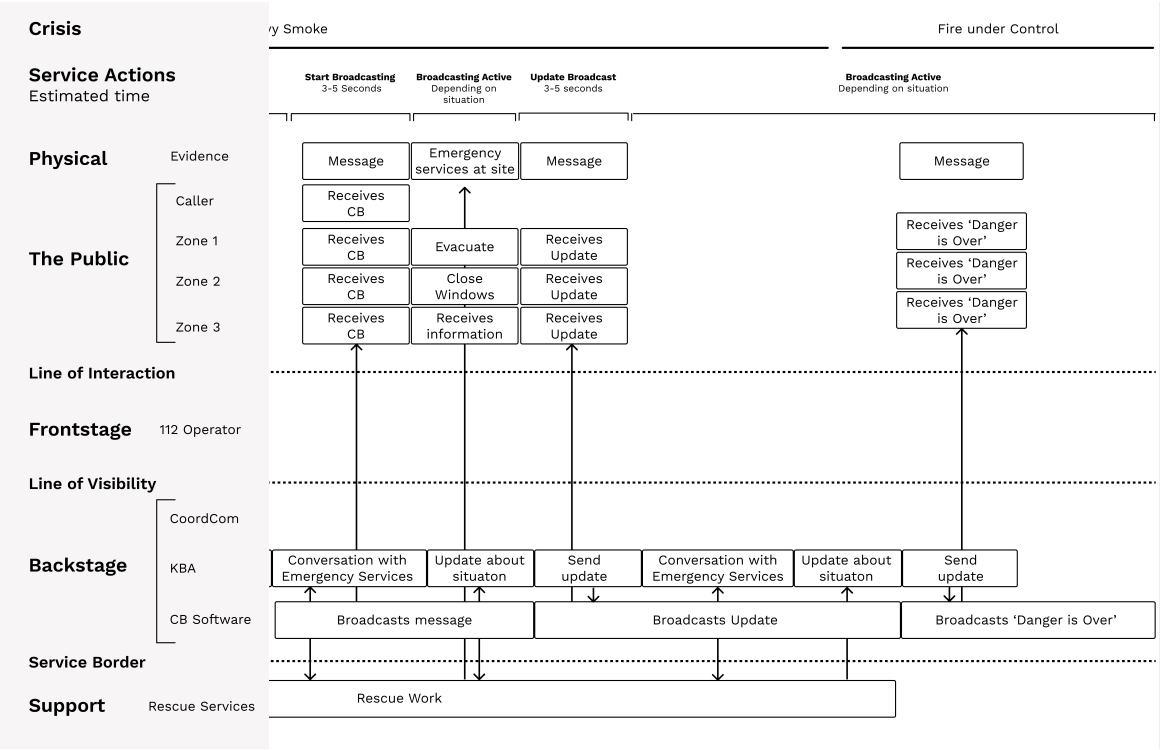


Figure 11.6 The second part of the Service Blueprint

If an update is required, or if a message stating the danger is over should be sent out, the rescue officer at the site will provide a status update to KBA. The Hyperlocal Alert Message system provides a suggestion of a new message, including zones, alert levels, and message content, based on KBA's new input from the experts at the site. An update does not have to be sent to all zones, but rather adapted to what zones are deemed to be affected (see figure 11.6).

11.2.2. Features and Content

The Hyperlocal Alert Message-Software should include some features of the software, which have been explained in chronological order in the section 'Service Blueprint,' see Section 11.2.1. The features and their content is displayed in figure 11.7.

The features that the CB software should include are the possibilities to:

- Collect information from CoordCom
- Recommend zones
- Recommend alert levels
- Suggest content of a message, where KBA can change/add information
- Broadcast a message
- Allow for any changes in the message, zones, and alert levels, that KBA desires to make
- Update a broadcast

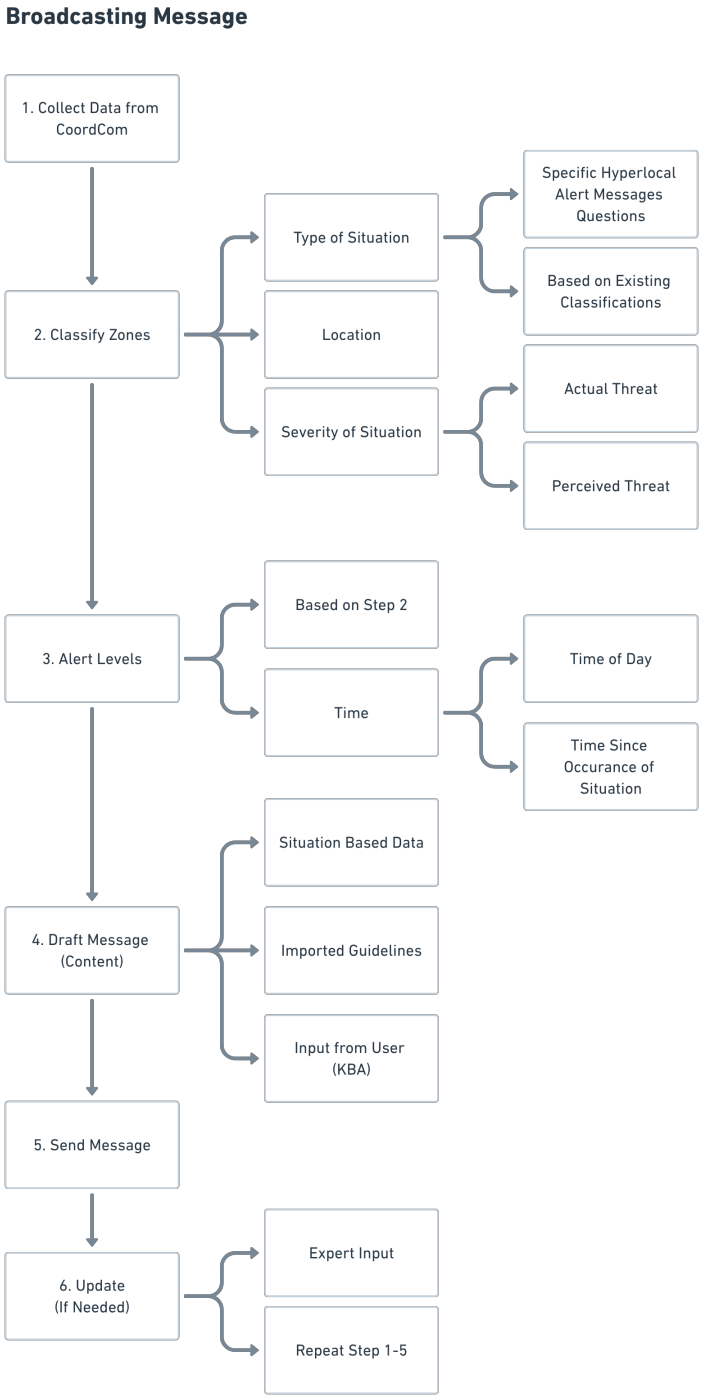


Figure 11.7 displays the features and content of the broadcasting software

The first step in the process is that the CB software collects data from CoordCom about the situation. This saves time for the KBA operator not having to input any data that is already existing. It also reduces the risk of making a mistake.

The second step of the process is to recommend zones. Based on the information imported from CoordCom, the number of zones should be recommended based on information such as the location of the situation, what type of situation it is, how severe it is, and also how

severe the situation is perceived as. The number of zones should be editable if KBA believes that changes should be made.

The third step of the process is to determine alert levels. These levels should be recommended based on the previous steps in the process, but also other factors such as the time of day and the amount of time that has passed since the event. The users' tolerance for being disturbed by a message with full sound and vibration while sleeping is inevitably lower compared to being awake, therefore time is inevitably a factor to consider. Furthermore, depending on when the crisis occurred it might be more or less urgent to alert the affected public. The alert levels should be possible for KBA to edit.

Once the zones and alert levels have been determined, the KBA operator can draft the message. The software should generate a message or at least include the necessary components of the message. The operator should be able to edit the content of the message if deemed necessary. The generated message, or components of message, should serve as a base in order to ensure that the most important pieces of information is included and that the messages are consistent with what information is sent to the public. At this stage in the process, the message is ready to be broadcasted to the public.

If KBA receives new input from a rescue officer or any other expert in the field, the CB software should offer a possibility for KBA to add new data about the situation. The software should then recalculate the zones, alert levels, and message content, as it would for a new message, and send an updated version of the message based on the new input.

12. Summary of the Service

Hyperlocal Alert Messages are broadcasted to 1-3 different zones depending on the need for information, required action, and also providing information. Providing information to a larger extend than the immediate proximity can miminize the load alleviations on the 112 number. The service is managed by the KBA, with the aim to standardize the service and make it more efficient. The selected technology is Cell Broadcast, based on its ability to distribute messages to all smartphones inside an area without being affected by other data traffic.

The developed service has the potential to better utilize the data that is collected by 112 operators and provide the public with relevant information. Shifting the responsibility of determining when a situation calls for an IMP from rescue officers to KBA could create a national standard for broadcasted messages. The messages broadcasted do not necessarily need to imply a risk for life or property for the receiver, like IPA:s are at the time of writing the thesis, rather be a source for relevant information in situation classified to be of interest for the public.

Part 4: Discussion and Conclusion

In this part, a discussion regarding the different aspects of the thesis project and future work will be in focus. Furthermore, conclusions are provided that answer the question of whether the aim has been met and objectives of the project fulfilled.

13. Discussion

In this chapter, the process, methods, design of the service, sustainability issues as well as future work are discussed. The aim is to discuss aspects of the thesis which could have been improved and to show the transparency of the results.

13.1. Process

The process of the project was mapped out through a Gantt chart, identifying when different parts of the project should be concluded to stay within the time frame and the scope. Initially, the process was planned to be iterated several times and focused on creating a well-defined product, the frontstage. As the project became more defined, it was clear the project was more in line with a service design process. Both a frontstage solution and a backstage solution had to be considered to become a credible solution, and to investigate if there is a possibility of implementing this type of service into SOS Alarm's organization. This in its turn, led to a re-planning of the process. This then inevitable had the consequence of a less developed fronstage concept.

A decision was taken to investigate how the frontstage could work for SOS Alarm's organization in order to create a feasible concept. This in its turn lead to the development of the backstage solution. The decision to investigate the implementation of the frontstage and development of the backstage was made based on the desire to create a holistic solution for distributing important messages, rather than finalizing zones and alert levels. Finalizing the frontstage, with more precise guidance on zones and alert levels, is deemed to benefit from large-scale testing. This did not fit within the scope of the project due to time constraints. Developing a service design concept has led to a more complete service which, with further work, could be implemented, tested and analyzed, if it is considered as a suitable solution for both the public and SOS Alarm.

13.2. Methods

The outcome of the project can be regarded as satisfactory, based on preconditions and the time frame. One factor that made the project difficult is that the user group is very large and varied. There was neither enough time nor resources to conduct a countrywide and a more in-depth study. To compensate for the smaller scale study, and to narrow down the scope, the media habits of the Swedish population were used as a basis. This was done in order to focus on creating a complementary service to the current PWS that can reach the users currently not being reached by traditional media. Also, as the media habits show that a larger part of the population are decreasing their consumption of traditional media, in favor for digital media, the selection of more digital participants were in line with the trend of media consumption.

Participants in the workshops and interviews during the user research phase consist of a fairly homogeneous group of people who match the 'younger generation' discovered in *Citizen's Media Habits* (see Part 1) and who are not representative of the entire general public. This was however compensated by applying so called source triangulation. Triangulating was an attempt to find what needs the general public has through many different sources; a survey, interviews with 112 operators, literature as well as interviews with representatives from countries who have implemented a similar PWS-systems. Important to

point out is that the requirements from the user research is not limited to the more digital part of the population, however based on them. More user research is desirable with the scope to include a broader, more heterogeneous group of people than what possible during the thesis project.

The PUGH matrix, used for identifying which of the technological solutions suits the requirements for the service, showed (the unweighted list) that cell broadcast (CB) was the most favorable technology but an application received almost the same score. When adding the weighted requirements, CB was found superior to both SMS and an application. The weight was based on input from experts as well as users to find the optimum solution. However, opinions and expert knowledge are always subjective even though they are professional. All things considered, the outcome can be considered reliable, but should of course as all subjective results, be interpreted with some precaution.

13.3. Design

The service is based on the research conducted and answers to the identified needs. However, there are aspects which should be iterated and evaluated to ensure a reliable system.

13.3.1. Frontstage solution

The frontstage solution provides relevant information to persons in a certain proximity to a crisis. Receiving the information with different types of alert levels are meant to guide the user in understanding how severe the situation is. From initial testing, conducted as part of the thesis project, the solution answers to the identified needs. Nevertheless, the proposed solution would benefit greatly from being evaluated and tested on a larger scale and as similar to a real situation as possible. As the solution is meant to suit the general public with access to a cell phone, further studies on other user characteristics than that of the digital generation which has been the focus of this project, is highly recommended from a universal design perspective.

The strengths of the frontstage solution are the possibility to tailor it to different needs. The system is dynamic and would work for different types of situations by combining zones, alert levels, and content. As the system has been developed to be dynamic, the zones and alert levels need further evaluation and research. Zone limits and alert levels have been assumed based on the conclusions made from user research; the closer to the situation, the higher alert level.

The technology chosen provides the opportunity to broadcast long, multiple page, messages. This possibility should however be used with caution to not risk sending too much information to the user, overflowing them with information. Where this boundary lies would benefit from testing. One hypothesis developed during the project is the possibility to send longer messages for situations that are not deemed too severe and requires immediate action from the user. For example, when there is a risk of E-coli in the water (non-deadly but has uncomfortable consequences) it might be beneficial to broadcast a longer message. This was tested in a focus group with the public (chapter xx) but given the limited number of participants the results are not deemed enough to verify or disregard the hypothesis.

Another aspect that needs to be discussed is the fact that the identified boundaries for each crisis are based on the opinions of the public not present in a crisis at the point of the investigation. The boundaries are based on perceived dangers and have only taken the users' personal desires for receiving information into consideration. The people included in the workshops were not experts in estimating how large area a situation might affect, such as a rescue officer is. The studies show that experts also have a difficulty to estimate how large areas that will be affected, and therefore it can be assumed that boundaries are always dynamic and will always need to be adjusted for each situation.

What was also apparent in the studies are that people have faith in authorities distributing information that is relevant to them, unless it is apparent that the situation is not affecting them. Therefore this can be seen as an opportunity for SOS Alarm to distribute more information about situations that are currently not included in the IMP service, and these boundaries can serve as a guideline.

13.3.2. Backstage solution

If KBA is to decide when to send out Hyperlocal Alert Messages, rather than the Rescue Officer, it would provide an opportunity to inform the public at an earlier stage. However, this shift of responsibility might be experienced as a threat by the rescue officers, and other experts, to their profession, as a part of their mandate will be shared with KBA. This threat and negative consequences could potentially be avoided by still allowing the rescue officers to require a message when they see it fits, as is the case in the current system.

This shift in responsibility can make use of KBA competence and work task in a better way. It will however also increase the workload for KBA, and therefore it is encouraged to evaluate if it is reasonable to add this responsibility to their tasks. KBA can with this solution contact the rescue officer, instead of the opposite as is the case today, to receive situation specific data.

Providing support to KBA in the creation of a Hyperlocal Alert Message, using guidelines and decision support, means that KBA would not have to guess what information to distribute and to where. They will still have the mandate to change the suggestions from the CB software, if the rescue officer or KBA thinks something ought to be changed. Nevertheless, by suggesting zones, alert levels and content, the solution will hopefully set a national standard of how messages are broadcasted in Sweden and what situations that are considered important information.

If shifting the decision to KBA, it is important to establish good communication channels between KBA and rescue officers. This is important to be able to harvest the expert knowledge from the rescue officers who are at the scene of the event, for KBA to make informed decisions. It is equally important for Rescue Officers to be able to make clarifications and feel that they also are in control of what information is distributed to the people in the area that they are leading the rescue work in. Removing the responsibility from the rescue officers can create a more uniformed message distribution nationwide, instead of having information distributed depending only on individual experts in different parts of the country.

13.4. Technology

The technology considered was chosen based on what could be used in a PWS at the time when the project was conducted. This means that more futuristic and innovative concepts were not investigated. However, CB is still a fairly new technology and is constantly being developed tailored to the needs of each PWS. This is very appropriate for the frontstage solution and also holds a large potential to improve an already implemented system for future devices users might have. As CB is a priority 1 service, it is highly reliable in a crisis. Information will, therefore, most likely will reach the intended area to a higher extent than an SMS.

The insights gained from this study act as a foundation to view different technical solutions with more concrete evidence, and to some extent scepsis. For example, developing an application was, based on user research, seemingly a good solution. However, although users claim to desire an app, experts and real-world examples show this might not be the optimal solution. As an example, France developed an application that should serve the purpose of reaching the public through the devices the users already has but had a low number of downloads and severe problems with delivering an important message in time during the terror attack in Nice. This might have affected the view of developing an app in this project. It also led to an investigation of what functions in an app that the users find desirable, and evaluate if these functions fit within the scope of the service.

The option to opt out of from most CB messages provides the users with a choice, while still ensuring that the most urgent information will always be received. Allowing the users to opt out can be considered favorable, as the information distributed should be relevant for the user. If the user does not perceive the information in the outer zones as relevant, opting out will be a way for them to tailor it to fit their own needs, to some extent.

The cost of implementing cell broadcast is estimated to 45 million SEK and an additional 10-15% of the initial cost for yearly support. This is a high cost. However, the development and implementation of the SMS solution has cost around 125 million SEK (divided over the cause of 5 years, 2013-2019)[54], and the price tag after 2019 is yet to be decided.

13.5. Sustainability Issues

This project has focused on social sustainability. As the trend analysis shows, the most digital part of the population is not reached by the traditional media. More and more people are changing their media behavior, in favor of consuming information online. When developing a digital service; distributing information to everyone with a smartphone, this means including approximately 80% of the population. As this CB is natively built into smartphones, it also means that anyone visiting Sweden and who has their phone turned on will be able to receive a message. At the same time, this means that there is a group of the population who will not be reached, as they do not such a phone. Nevertheless, as the solutions is proposed as a complement to the current TV, Radio and Signal system, it is not deemed to be an issue not reaching the last 20% who does not have a phone. Rather this can be seen as an improvement for a majority of the society, reaching the user group that might miss the information in the main channels.

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[54] SOS Alarm, 'Befolkningsvarning I Mobil- Och Fast Telefoni Samt Stödfunktion För Aktörers Kriskommunikation Till Allmänheten'

Sending a message with CB technology means that the sender has no knowledge of who are located in the cell, treating all people present in the cell as equal, and ensuring anonymity. This also means that SOS will not be able to cater to specific needs or requests for information. There are however also parts of the population who believe all important information should be spread nationwide and who would prefer to always receive information about urgent events, no matter their location. As there already exists services for this, such as MSB's application *Krisinformation,* this aspect was not investigated further within this project.

One goal of social sustainability is to take different opinions into consideration, and this has definitely been the case in this project as the research is based on the opinions of the public.

To conclude, the design proposal, using CB technology to distribute information, can be argued to be social sustainable. This solution treats everyone in a specific area with access to cell phone as an equal. The goal is to send information to each individual, reaching everyone at the same pace, which means that everyone has an equal opportunity to take precaution. This further means that is does not matter what mobile carrier a user has, or if they have access to a TV, Radio or are close to the sirens. This might potentially save more lives.

13.6. Future Work

The future work of the solution is divided into *Frontstage Solution, Backstage Solution, and Implementation*.

13.6.1. Frontstage Solution

The information sent out to the end users needs to be perceived as relevant. Therefore more studies regarding the zones, alert levels and content are encouraged. For development of content in the Hyperlocal Alert messages, further reading in the subject can be found in articles issued for the CHORIST (Integrating Communications for enhanced environmental risk management and citizens safety) project[55]. The concept should be tested with different scenarios and evaluated as to how the information is received. Further, how confirmed/verified the information need to be by SOS Alarm when broadcasted should be investigated. For example, if there is a risk for a non-lethal disease (such as E-coli in the water) the information could potentially be sent out even if it is not confirmed, while a military invasion might have to be confirmed in several ways before the information is distributed. This, as the event is perceived as a more important and urgent by the public and that the information might cause more stress for recipients than information about a non-lethal disease would. To further verify the set boundaries of the zones, experts from each department, such rescue officers, that can request an IMP should be involved in the process. This would greatly improve the decision support software for recommending zones and setting alert levels.

[55] HM Jagtman, 'Lessons Learned Bij Delft University Of Technology On Emergency Warnings' (2008).

13.6.2. Backstage Solution

Also the backstage solution should be further developed and investigated how decision support could be developed for KBA. The main focus when developing the backstage solution was the use case of a fire, so several scenarios should be tested and evaluated in order to validate the solution. Furthermore, further work should include an investigation, together with KBA, regarding what decision base they need in order to make informed decisions and broadcast a *Hyperlocal Alert Message.*

13.6.3. Implementation

As CB is not implemented in Sweden yet, the public should be informed before receiving their first message. The public should be clearly informed how the service will be used, what the different levels mean, and also explained the possibility to turn off the less urgent levels. They should also be advised not to turn them off. Being transparent to the users as to what they can expect, and how they can limit the notifications is most probably a way to increase their trust of the service.

When informing users about the usage of cell broadcast, the campaign should be on as many platforms and channels as possible, not only SOS Alarm's own or Public Service, to ensure that everyone is reached by this information and not only the ones that are specifically interested in matters of society. Also, when testing the PWS system, CB messages should be sent out with a clear explanation that they are test messages and refer to where more information about this system can be found.

14. Conclusion

The aim of this thesis was to design a service for distributing important information in a digital form to the public. This was done by focusing on the following areas:

- Understand what the public perceives as relevant and important information
- Study how the public want and are most likely to be reached by relevant information
- Investigate at what *distance* from a situation a person still find information *important*
- Design a strategy and provide guidelines for the design of a service.

It can be concluded that the more likely a situation is to affect a user, the more important the person finds the information. This also has a strong positive correlation with the level of acceptance towards receiving a message. The further away a person is from a situation, the more dangerous or severe the crisis has to be in order for the person to care. Examples are situations that might have a consequence for the entire nation. These types of situations can still be perceived as relevant to receive information about, even though they happen 1500 kilometers away. However, receiving information about a fire in another municipality is often not considered important information and therefore regarded as spam if receiving information about it.

This study suggests that people are highly likely to be reached by messages to their cell phones. This is supported by research stating that the Swedish population is becoming more and more digital. Fewer people use the traditional channels, such as analog radio and TV; and this increases the risk of missing important information broadcasted through these channels.

14.1. Design of the Service

The new suggested service is called Hyperlocal Alert Messages where people will receive information about situations based on their distance to said crisis. What information and to what extent the information will reach the is dependent on the situation, as this offers a more flexible solution than the information distribution today.

The service will be managed by KBA. This will hopefully create a standard for what information is distributed, using both the classification from the temperature questions in CoordCom and the Hyperlocal Alert Message-software which suggest what, when, how, and where information should be distributed. The software should offer decision support in the form of recommending zones, alert levels, and content for the KBA to review and change if their expertise deems it to be necessary.

The service is based on the technology Cell Broadcast, a service that can broadcast text messages to all smartphones in a designated zone with at least GSM reception. Messages will reach everyone in a zone within seconds of it being broadcasted, will override sound settings on a user’s phone if it is extremely urgent, and users remain anonymous.

14.2. Final words

Today, a crisis must be deemed severe enough so that an IMP is issued on a national level and broadcasted on radio and TV before it can be sent as an SMS to an area or address. This means that the entire population must receive information that in most cases only is relevant to a subset of the population. The *Hyperlocal Alert Messages*-concept offers a possibility to distribute more targeted information to the population. This means that when an individual receives a message from SOS, it is considered relevant to her or him. The information will reach everyone in a defined area simultaneously, and requires no action from the user to receive it. This solution offers a possibility to create more consistency in the distribution of alert messages in Sweden. Furthermore, there is a great possibility to reach the public to a larger extent than today, by sending information to a device that most people have in their immediate proximity.

The solution fulfills the formulated aims and objectives to deliver the first concept for a new alert messaging service. The service is still on a conceptual level and will need further development to be able to become a fully working service. Therefore, considering the scope of this project, the results can be deemed satisfactory. Hopefully, this results of the thesis project can contribute to the development of a modern and effective public warning system in Sweden.

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16. APPENDIX

Appendix I - Frågor till KBA

Mål med intervjuer

Målet är att tydligare förstå deras roll i VMA-kedjan. Hur skulle en KBA:are kunna använda sig utav "löken" och vem borde ta beslutet om nivåer?

Hur relationen mellan KBA och RL/RÅ kommer även att undersökas

Vilka krav har KBA på informationen innan de skickar ut den?

Frågor

KBAs arbete

- Vad är dina arbetsuppgifter under en vanlig dag?
  Meddela myndigheter, helikopter
- Hur många VMA skickas ut per månad/år/vecka (vad som är mest relevant att räkna på)?
- Kan du beskriva hur processen går till från det att du för första gången hör att det är prat om att skicka ut ett VMA tills du är klar med ditt jobb?
- Är det något steg som är extra svårt/kräver mer av dig
- Hur lång tid tar en sån här process cirka?
  - Är det från att 112an har hört om det första gången eller från att RL är där?
- Upplever du att hela kedjan går snabbt nog idag?
  - Varför?
- Vilket steg skulle du säga tar längst tid idag?

Information:

- Vad för information önskar du att den som begär ett vma skulle kunna ge vid ett samtal för att du ska kunna hjälpa dem på ett bättre sätt?
- Vilka regler följer ni när ni komponerar ett informationsmeddelande?
  - T.ex plats, handling, förväntad tid?
- Hur skulle det kännas att skicka ut något som inte följer de reglerna?
- Hur upplever du sättet att skicka ut information idag?
  - Via radio och tv?
  - Vid utskick av SMS?
- Gör bedömning av situationen - anpassar vid behov

"Framtidens VMA"-frågor

- Hur skulle du vilja att SMS-funktionen skulle tillämpas på VMA?
- Vad hade du velat kunna skicka ut för meddelanden? (här tänker vi även om det inte är vma eller om det ska skickas ut lokalt)
  - Skulle det vara aktuellt att skicka ut olika information till olika delar?
- Finns det något steg i processen där det hade kunnat gå att samla infon som finns för att skicka ut detta när det behövs?
  - Till exempel: använda temperaturfrågorna som 112orna har för att klassa hur pass allvarlig händelse det är, hur skulle det kunna användas för er för att t.ex kunna ge indikation om att ett VMA skulle kunna skickas ut lokalt i det området?

Appendix II - Möte med MSB

Syfte: Få MSBs syn på dagens och framtidens VMA.

- Beskriv er roll inom VMA-tjänsten
    - Vilka delar äger ni?
- Vad är era tankar kring den relativt nya implementationen av SMS-utskick?
- Hur bör myndighetsmeddelande kommuniceras ut?
- Hur ser ni på framtiden för VMA?

Appendix III - Pilotintervju

Målet med intervjun är att ta reda på: Hur VMA fungerar för allmänheten och vad för- och hur de önskar mottaga information
Inleda med att det inte är ett test för att bedöma den intervjuades kunskaper, utan att veta vad som kan är känt och inte bland de som vi intervjuar. Vi vill ha så ärliga svar som möjligt och intervjun kommer så klart att vara helt anonym

Kunskap om VMA

- Känner du till Viktigt Meddelande till Allmänheten?
- Vet du vem eller vilka som har ansvar för den funktionen (VMA)?
- Vad skulle du göra för att få mer information?
- Skulle du kunna förklara vad ett viktigt meddelande till allmänheten är och vid vilka tillfällen det ska användas?

Berätta om vad VMA är, vilka som arbetar med det, och i vilka lägen det får användas
Viktigt meddelanden till allmänheten, VMA som det ofta förkortas, används när det är fara för liv och egendom. Det betyder alltså att det endast får användas när det är en krissituation som kräver att allmänheten tar till vissa försiktigheter eller utrymma, till exempel vid brand där röken är giftig och allmänheten måste antingen stänga dörrar och fönster eller utrymma ett visst område. VMA ska, i nuläget, inte användas för att meddela information från kommunen, till exempel om det är bakterier i vattnet ska VMA inte användas då personer kan bli sjuka, men det är inte risk för liv.

- Kan du berätta om hur du upplevde bränderna i somras?
- Hur upplevde du avståndet mellan dig och branden?
- Vart fick du information om bränderna?
- (Sökte du aktivt efter information om händelsen?)
- Hur reagerade du när du såg brandröken över vattnet?
- Varför hade du den reaktionen?
- Vad hade du velat ha för information i ditt specifika läge?
- Var faran över vid något tillfälle?
- Hur fick du reda på det?

Intervjupersonens önskemål på information

- Söker du efter information om du får ett VMA?
- Vad för typ av information önskar du att du hade haft tillgång till? (innehåll)
- Är det någon typ av information du önskar att du inte hade haft tillgång till?

Berätta om hur det funkar i dag
Majoriteten av informationen går ut via Sveriges Radio p4, TV, via krisinformation.se:s app, webbsida eller sociala medier. Man kan även få sms eller meddelande via fast telefoni. Man kan även få VMA från tutor, eller tyfoner som de heter.

Hur vill personen få reda på att det är fara för liv och egendom

- Vad tyckte du om det sättet du blev informerad om faran?
    - Varför?
- Vilket annat sätt hade du velat få information på?
    - Här kan vi tänka visionärt, vad kan framtidens VMA innebära?

När berör informationen personen?

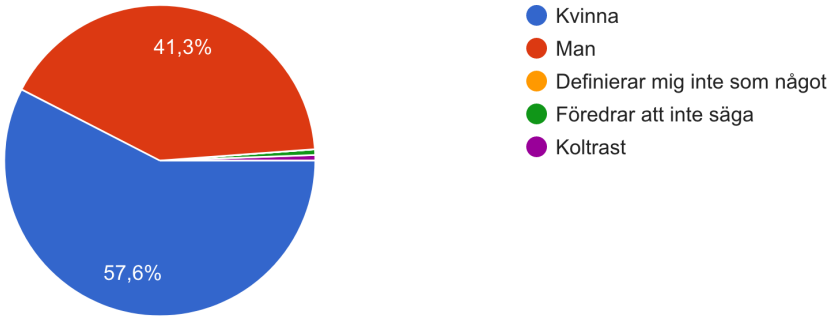
- När anser du att informationen i ett VMA är relevant för dig?
    - t.ex som i dagens vma, inom höravstånd på tutorna, textremsan på tv, eller i radio p4
    - *(omedelbar närhet, nationell säkerhet)*
- Vilka situationer tycker du vore relevant att få information om?
    - t.ex som i nuläget, risk för liv och egendom,
    - (*risk för smitta i vattnet, trafikolycka på favoritvägen)*
- Vad för information tycker du personligen inte är relevant att få?

Appendix IV - Enkät om hyperlokalt VMA

Fråga 1

Jag är

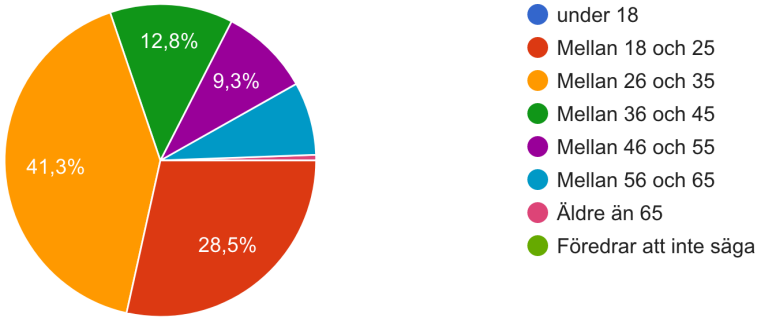
172 svar



Fråga 2

Jag är

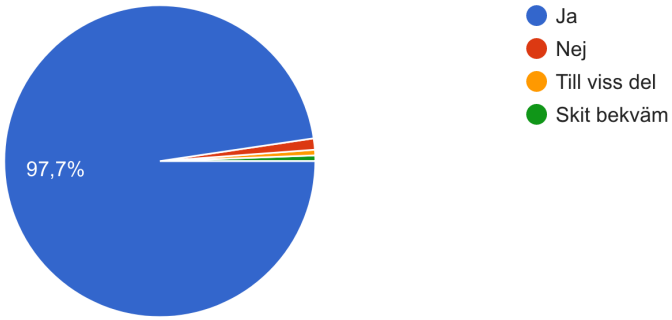
172 svar



Fråga 3

Jag känner mig bekväm med att använda teknik som smarta telefoner och datorer

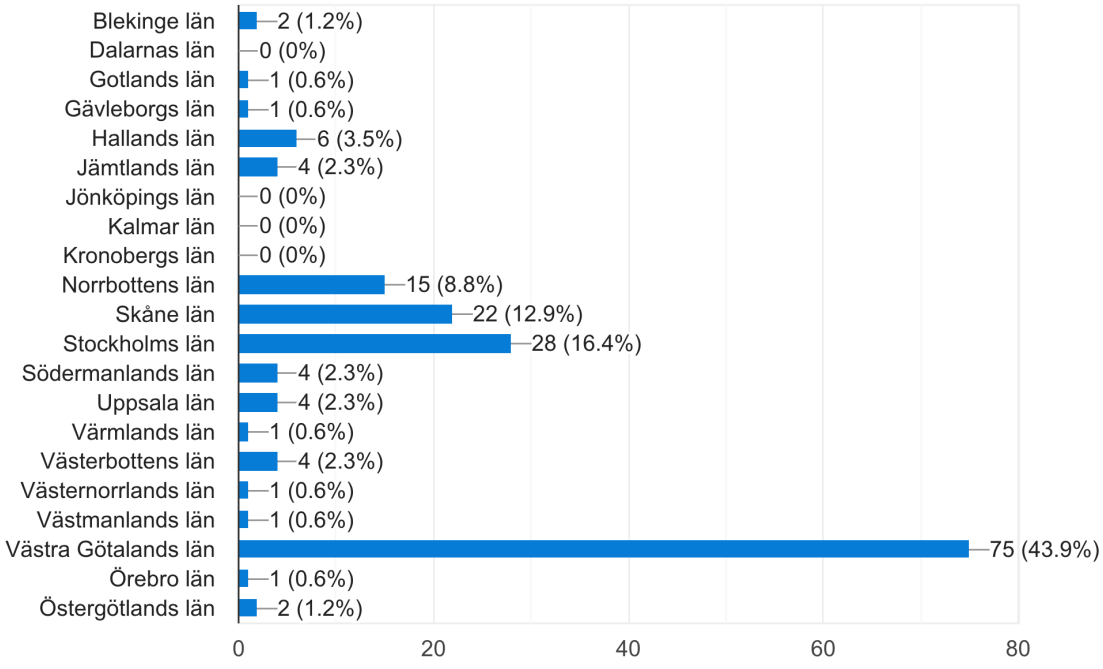
171 svar



Fråga 4

Vilket län bor du i?

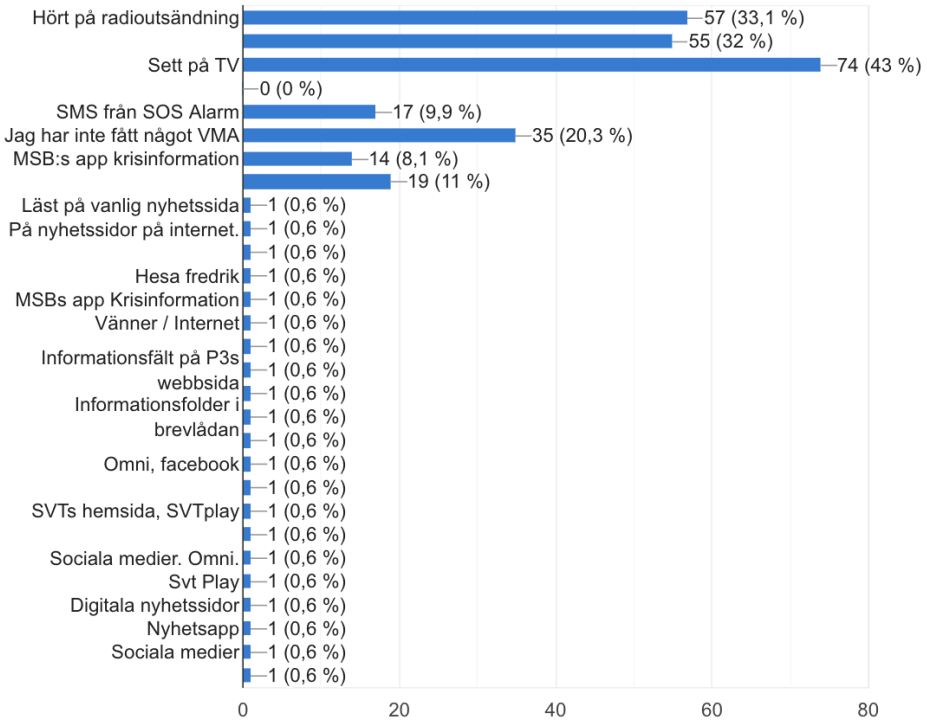
171 responses



Fråga 5

Under sommaren har många VMA skickat ut i Sverige med information, till exempel om bränder. Hur har du fått eller sett VMA under det senaste året? Möjligt att välja flera alternativ

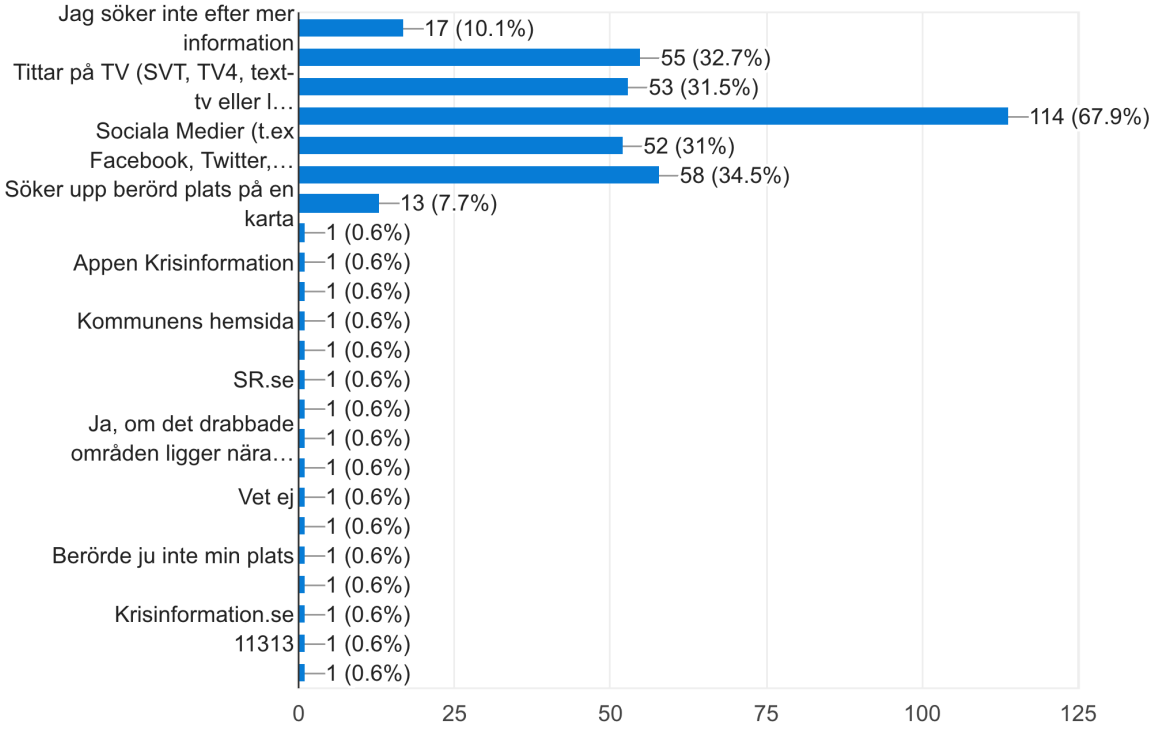
172 svar



Fråga 6

När du har sett eller hört ett VMA, söker du efter mer information och i sådana fall var? Möjligt att välja flera alternativ

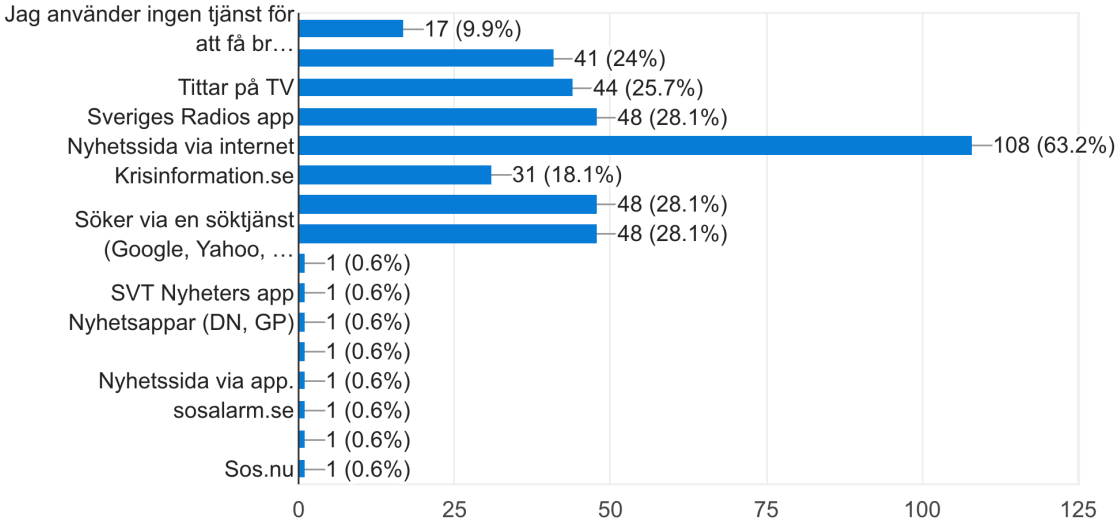
168 responses



Fråga 7

Vilka tjänster använder du idag för att få brådskande/viktig samhällsinformation? Möjligt att välja flera alternativ

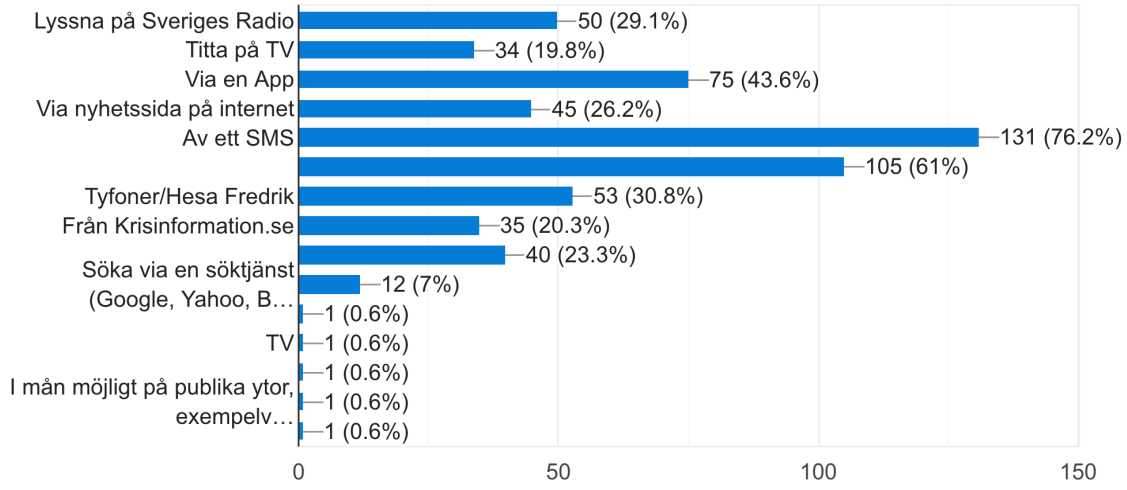
171 responses



Fråga 8

Hur skulle du vilja få brådskande/viktig samhällsinformation? Möjligt att välja flera alternativ

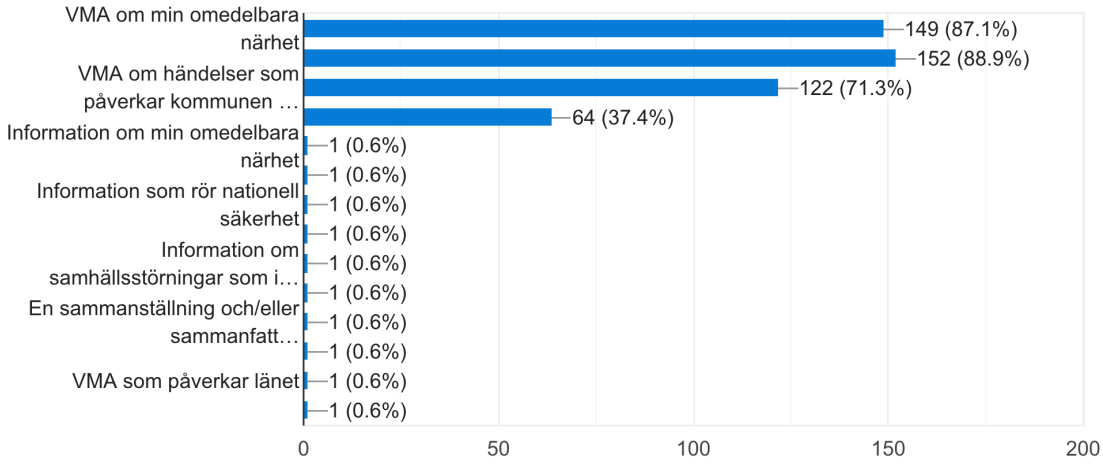
172 responses



Fråga 9

I vilken utsträckning vill du ha information om din omgivning? Möjligt att välja flera alternativ

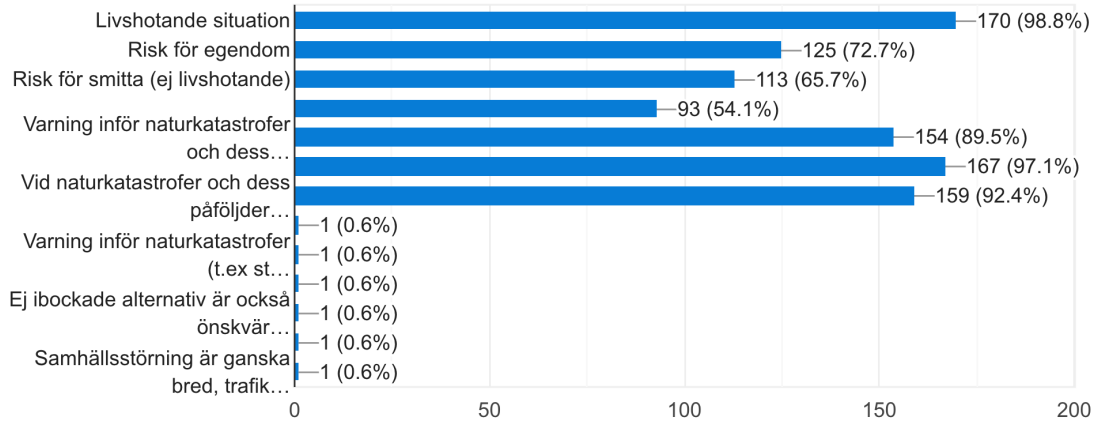
171 responses



Fråga 10

När, i vilka situationer, vill du få VMA? Möjligt att välja flera alternativ

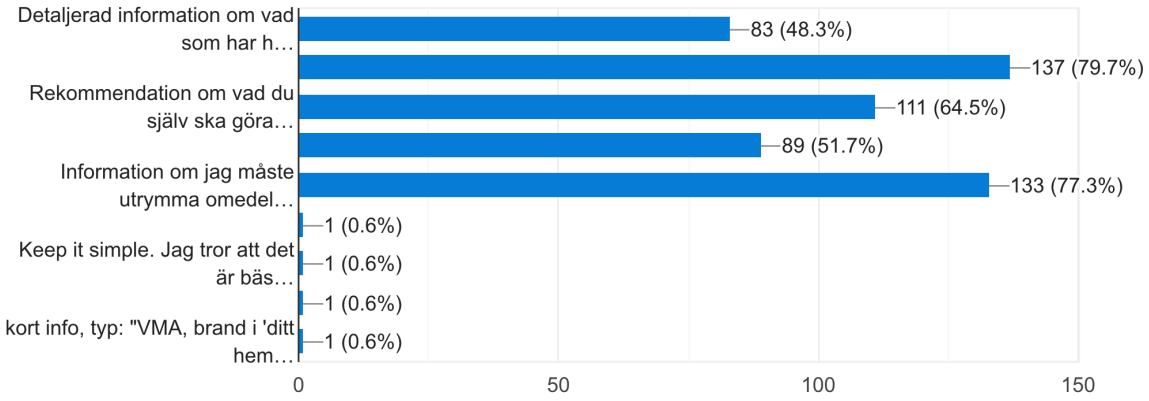
172 responses



Fråga 11

Vilken information skulle du vilja få i ett VMA? Möjligt att välja flera alternativ

172 responses



Fråga 12

Är det någon aspekt du tycker är extra viktig när du tänker på viktig samhällsinformation?

- Att den kommuniceras på ett seriöst men inte panikaktigt sätt, det ska inte skrämma utan informera och hjälpa
- Tillgänglighet, att man känner att det angår mig dvs. Ej känns som spam
- Att det hänvisas till var mer information går att hämta samt om det gäller fara för liv.
- Att informationen verkligen är viktig, så att det tas på allvar. Med viktig menar jag att det är en verklig och ev akut fara för människor och människors hälsa att befinna sig på en viss plats eller att man bör vidta vissa åtgärder för att undgå fara.
- om det drabbar mig eller någon i min närhet.
- Att den är tillförlitlig och korrekt
- Informationen måste vara tydlig och inte lämna utrymme för tolkning.
- Skicka endast ut när det verkligen gäller något viktigt, så man vet att det verkligen är allvar och viktigt när man ser ett VMA.
- Att även vi på landsbygden, som inte hör hesa Fredrik får information.
- Att få meddelande i livshotande situationer med information om vilka som är berörda och hur man bör agera.
- Livshotande situationer borde förmedlas till alla genom telefon som ett sms eller dylikt.
- Prioritetsordningar - "bra att veta" eller livshotande bör behandlas annorlunda.
- Att den finns på flera språk och att de som turistar i landet också uppmärksammas på VMA.
- Kort koncist och tydligt. Vad ska jag göra. Hänvisning till var mer info finns. Någon variant också som inte är digital (typ P4) om internet slås ut.
- Att informationen kommer ut så fort som möjligt på flera olika sätt.
- Att det ska vara tillgänglighetsanpassat.
- Kort, koncist med möjlighet till mer detaljerad info på annat håll
- Relevant och kortfattad med hänvisning till mer info i annan kanal

- Om elnät, mobilnät och telefonledningar etc slås ut, hur ska jag då kunna få informationen på bästa sätt? Känns som att min generation allmänt idag förlitar sig på telefoner, smartphones, datorer och tv etc som vi använder för att få information om det händer eller har hänt något. Jag vet inte vad bästa sättet för att få info är om inget av de sakerna skulle fungera just då.
- Att bara meddela om de absolut viktigaste situationerna
- Vad har hänt och vart. Vad göra. Var hitta mer information.
- Att det kommer ut snabbt från en säker källa utan att jag behöver höra saker från omvägar och kolla upp det själv via internet
- Jag anser att all info är viktigt om det är ett VMA som berör området där jag bor, har man bestämt för att det ska gå ut ett VMA så kvittar det vad det gäller.
- alltid tillgänglig, tex hesa fredrik som kan höras överallt utan tex internetuppkoppling / mobilnät
- Det viktigaste är att man blir meddelad när man möjligtvis är i fara, samt vart mer information finns.
- Tillgänglighet. Många till synes redundanta system (app, sms, digitala TV-sändningar t ex) kräver åtkomst till internet på ett eller annat sätt, analoga sändningar via radio är därför viktigt.
- Vara på flera språk, ex engelska och arabiska.
- Att få snabb kort information och enkel möjlighet att tillgå mer information om en själv är berörd/intesserad
- Att det finns detaljerad information så det inte krävs att jag själv gör detektivarbete för att hitta den. Särskilt om det är något i min närhet, då vill jag oftast veta så mycket som möjligt, vore smidigt om detta var samlat på ett ställe så man vet var man kan hitta det.
- Att folk som inte kan svenska, eller folk som har kognitiv funktionsvariation också kan få ta del av VMA på ett anpassat sätt
- Att flyglarm, mobiliseringslarm och liknande är lätt att urskilja och kommer genom betrodda kanaler och betrodda kanaler endast. SR och hesa fredrik primärt
- Att informationen inkluderar vad ska jag som individ göra och var jag kan bistå om hjälp behövs
- Måste komma från ett trovärdigt medium
- Snabb och direkt riktad info som är nödvändig att ha där jag befinner mig
- Vet ej
- Description, severity, proximity, recommended action
- Att det sänds på svenska och engelska då många av mina vänner har begränsade svenskakunskaper.
- Hur jag själv bör agera
- Att något har hänt
- Att den ska vara tydlig och inte gå att misstolkas
- En kombination av säkerhet (för att motverka desinformation - "fake news"), tydlighet (hellre en mindre mängd information som är lättbegriplig och lättare att ta ställning till, än en lång utläggning - åtminstone i ett inledande skede, bättre att separera, och skicka vidare dem som vill ta del av information till någon mer ingående artikel) och tillgänglighet. (Redundans och spegling av information på flera platser, så väl digitala som fysiska.)
- Att den kan nås av så många som möjligt, även de som inte har tillgång till tekniska hjälpmedel.
- Vad man själv ska göra för att undvika att råka ut för olycka.
- Var man få mer information

- När det är fara för liv, hälsa och egendom!
- Tydlighet och att korrekt info kommer ut snabbt.
- Att den kunna påverka mig
- Att systemet för att sända ut information är okänsligt mot störningar, t.ex. att rationalisera bort hesa Fredrik till förmån för enbart appar eller dylikt är enligt min åsikt något som skulle vara fruktansvärt oansvarigt.
- Att man inte går ut med VMA för ofta ,alt att man har olika nivå av VMA
- Vad jag kan förvänta mig från samhället/myndigheter
- Vi som bor på landet och inte har nån Hesa Fredrik skulle vilja ha en app eller sms istället. Antingen registrera sig för sms eller ha plats på i tfnen,vilket inte alla har på alltid.
- Att vma som går ut hänvisar till pålitliga källor/sidor för mer information och uppföljning
- Tydlighet
- Att det hålls kortfattat och var jag kan läsa för att själv ta reda på mer information. Att det inte kommer för ofta, då tar jag det inte på lika stort allvar.
- Vad som hänt, var det har/förväntas inträffa och om jag förväntas agera på något sätt.
- Renodla VMA till allvarliga/farliga situationer och inte för samhällsstörningar
- Tydlighet i sannolikhet att det är en reell fara. Att jag kan dela den vidare.
- Att det kommer ut så fort som möjligt på många olika kanaler (tv, radio, sociala medier etc)
- Nå även turister som vistas på platsen med info på engelska
- Att ge direktiv för folks agerande. Säg till folk vad de är rekommenderade att göra.
- Smittspridning, naturkatastrof i närområde samt aggressio av främmande makt
- Att det finns lättillgängligt och att det inte används i onödan. Att få det på telefonen vore bra eftersom den är med överallt, men luren pingar för mycket som det är så det får inte bli ytterligare en spamtjänst. Bara sånt som är relevant

Fråga 13

Har du en egen idé eller tanke om hur framtidens VMA skulle kunna se ut? Skriv gärna det här

- Jag tror att det hade varit bra att komma ihåg att även om många människor svarar att de vill ha den via en app eller liknande så finns det också många som inte vill eller kan använda mobil så att lösningen bör kunna täcka in även dem. En idé jag kommer och tänka på är funktionen med trafikstopp på radion som avbryter andra sändningar, och till och med går igenom trots att man inte har på radion. Kanske att det skulle kunna vara något att kika på, tror det hade kunnat nå ut till många. Vet inte om det är optimalt men i bilen funkar det bra tycker jag.

  Lycka till!
- En applikation som man kan ladda ner till telefonen. Man kan ange vilka län/områden man vill få notiser om. Olika färgkoder eller dylikt i notisen för att fort klargöra vad ärendet gäller (exv naturkatastrof, krig, smitta, kemikalier osv). Vid ärenden i ens närhet om det är viktigt att fort få information, kan applikationen larma likt ett telefonlarm eller så.
- Alla har idag en telefon med sig, alltid. I stort sett alla kollar omedelbart vid aktivitet på telefonen. Det måste ju gå att nyttja..?
- Jag tror att sms eller app skulle vara bra sätt att nå ut med viktig information, i synnerhet som allt fler har smarttelefoner och är vana vid att använda teknik.

- Jag vill ha möjlighet att registrera mobilnummer och områden.
  Meddelande ska kunna gå ut till mobiler i det område VMA berör. Det ska också gå till abonnenter som valt att få info om ett visst område oavsett var mobilen befinner sig.
- Ser definitivt en utveckling åt smarta telefoners förmåga att förmedla information. Notifikationer som ges för lokala händelser till alla som har platstjänst till exempel.
- Chip i hjärnan!
- Kunna välja det språk jag vill få VMA på.
- -
- Känns viktigt att det inte blir för många notiser. Att de notiser man får från VMA är sällan, så man tar det på allvar när det väl händer.
- Något sorts nätverk/community där man förutom får information även kan ha kontakt med familj och vänner. Framtidens VMA kanske skulle bli bättre på att inte bara ge information till mig, utan ge mig även information om min familj/vänner har tagit del av informationen. (awareness)
- Automatiska sms till berörda telefonmaster
- Känns rimligt att använda sig av den teknologi som finns nu, t.ex. smartphones, vilket ni uppenbarligen har tänkt på.
- Hatar att säga det, men en app hade nog varit smidigt! Iallafall om den blev vedertagen så all info verkligen samlas där. Så kan man ställa in själv vilken typ av notifikationer man vill ha och när.
- Behövs det förändras? Fokus borde vara stabila system som är svåra för främmande makt att störa ut eller skicka ut missinformation. Radio och hesa fredrik fyller kravet, iallafall på nationell skala.
- Ja, det skulle vara bra att kunna ställa in egna orter/områden som jag vill ha vma info om. Då har jag möjlighet att ringa nära o kära direkt
- Japans pushnotiser direkt till telefonen är bra för att nå alla i ett område. SRs app ger massa störande irrelevanta notiser som man ofta ser ganska sent
- Alla bär med sig sin telefon så vore smidigt att få ett meddelande via telefonen
- Utskicka via SMS! Redundant och når ALLA! Inget behov av app, nyhetssida eller annan tredje part. Infon kommer direkt från utsändaren direkt till min mobil. SMS:et kan dock innehålla länl till webbsida med mer info.
- Tycker något likande de notiser jag fått i telefonen är ganska bra. Inget sms eller notis från app. Vet inte exakt var det kommer ifrån, antar "regeringen", men man känner igen den och läser direkt
- Något abstrakt, men samverkan tror jag är ett mycket starkt ledord - där tekniska och organisatoriska möjligheter finns för att kommunikation skall fungera hela vägen från stat (genom MSB) ner till individ (främst då via myndigheter, regioner/landsting och kommuner), och där dessa snabbt har möjlighet att uppdatera lägesbilder, ge ytterligare information till samtliga övriga berörda parter, och även aktivera resurser på rätt nivå som kan assistera med att sprida säkerställd och användbar information.

  Som sommaren gav exempel på finns även frivilliga resurser tillgängliga att aktivera över hela landet, och jag tror dessa kan vara möjliga att använda även som en konstruktiv informationskanal, utöver exempelvis logistik. (Som sommaren gav mer prov på.) Att på mindre orter ha möjlighet att få ut personal som ger information till dem som inte kan/vill/vågar (äldre, sjuka, tekniskt inaktiva, etc.) ta del av det vi andra kanske utan att tänka på konsumerar i rask takt tror jag kan öka tryggheten och säkerheten i samhället, vid större händelser som kan kräva användning av VMA. Om inte separat personal "krävs", så i alla fall

lösningar för att redan aktiv personal (hemtjänst, kommunpersonal, detaljhandelsaktiva etc.) snabbt kan ta del av, och sprida, viktig information.

Så TL;DR: bättre samverkan mellan fler samhällsaktörer så att korrekt och viktig information sprids till fler snabbare.

- Typ sms med generellt meddelande och länk till mer detaljerat meddelande
- Positionera mobila enheter via GPS inom berört län likt SMS-Livräddare fungerar.
- Att den ska kunna skötas av alla nivåer. Nationell, regional och lokal nivå och kunna anpassas av de behov som finns i alla nivåer.
- Att utvecklingen går mot att använda flera fristående plattformar samtidigt (t.ex. Hesa Fredrik och tv och radio och appar och hemsidor osv)
- Att man inte går ut med VMA för ofta ,alt att man har olika nivå av VMA Låg , mellan och hög
- Undvik skrämselpropaganda och fokusera på fakta och trygghet i kris
- "Hesa fredrik" kompletteras med app från prisinformation och sms till aktiva mobiler inom utsatt område eller område som berörs.
- Att den oavsett sticker ut mer än alla puschnotiser/sms så man redan vid det visuella förknippar den med vma
- I USA så får man nödvarningar om en hel del. Det kan röra försvunna barn, översvämningar mm. Skickas ut till alla telefoner och piper som fan. Hur bra som helst
- Som nämnt i enkät = sms. Ev. Om att man kan registrera sig + mejladress via krisinformation.se eller liknande och få ett massutskick.
- Jag kan tänka mig sms, radio, Instagram, teve. Hade appen Krisinformation tidigare, men kändes rätt prematur, gamla varningar ligger kvar, visar fel län osv, men den kanske har utvecklats sista åren?
- Push till mobiler, liknande Unit Alert i USA
- Någon form av notis (sms eller push) med länk till webbsida
- Sms, eller notis i telefoner, dator, surfplatta
- Via SMS till de som är folkbordförd på platsen samt de som vistas på platsen
- Om internetuppkopplingen till individer blir såpass vitt spridd så kan man ju anse det rimligt att alla har tillgång till en uppkopplad enhet vid alla tider och kan på så sätt skicka till dessa. Mobil etc. Men vid strömavbrott så måste ett fysiskt system finnas, se hesa Fredrik mm.
- Om VMA kommer till lur/surfplatta/dator, kan det vara som alarm? Att en aktivt behöver stänga av det.
- SMS

Appendix V - Intervjuguide till 112-operatörer

Målet är att:
identifiera osäkerheter hos allmänheten vid krissituationer genom att undersöka hur SOS Alarm-operatörer upplever allmänhetens osäkerheter via samtal in till dem. Vidare ska intervjuerna undersöka hur operatörer upplever inringda samtal och vad de ser för behov av att kommunicera till allmänheten. Detta undersöks för att förstå hur framtidens VMA skulle kunna användas för en operatör.

- *Hur kan vi minska osäkerheten hos allmänheten vid ett VMA? Detta undersöks genom att identifiera vilka frågor en som ringer in i en nödsituation ofta frågar om, för att identifiera osäkerheterna de känner i deras situation.*
- *Vad är krav för operatörerna att få för information för att ha en relativt bra lägesbild? Vilka frågor är viktigast att få svar på för att de ska reducera deras egna osäkerhet gällande situationen.*
- *Hur ser relationen mellan SOS Operatörer och Räddningsledare/räddningstjänst ut?*

Frågor
112-operatörer

- Kan du beskriva hur processen går till från det att ni tar emot ett samtal tills att du lägger på?
- Vad ställer du (som operatör) för frågor till inringare?
    - Varför?
- Vad för information önskar du att de som ringer in skulle kunna ge vid ett samtal för att du ska kunna hjälpa dem på ett bättre sätt?
- Om det inte har framgått tidigare: *Bedömer ni vad för typ av situation det är? (för att få en uppfattning om vad det är frågan om)*
    - *Varför?*
    - *Hur gör ni det?*
- Vad är det som avgör hur angeläget en situation är?
    - Vad letar du efter för ledtrådar?

Allmänhetens osäkerheter vid samtal med 112-operatör

- Vad ställer folk för frågor när de rapporterar en kris?
    - Finns det klassiska frågor som många ofta frågar om allmänt?
    - Finns det klassiska frågor som många frågar i specifika situationer (vid t.ex. Brand)?
- Vad upplever du att inringare är osäkra kring?

- Händer det att allmänheten ringer och frågar efter information om en händelse?
    - Vad ställer folk för frågor då?
    - Vad svarar SOS?

Räddningstjänstens frågor

- Vad för information skickas till RT?
    - Finns det någon form av standard?
    - Vad skickar ni för att de ber om det?
    - Vad tror du skulle vara bra information att vidarebefordra till dem?
- Är ni i kontakt med en räddningsledare någon gång?
    - Skiljer sig RL och RTs behov?
    - Vad upplever du är viktig information för en RL?

Operatörens roll vid vma (typ vad skulle vi kunna göra mha operatören)

- Har du varit med om ett samtal som rör ett Viktigt meddelande till allmänheten?

    - Kan du berätta om den situationen?
    - Upplevde du att någon information saknades i den situationen?

- Kan du komma ihåg någon situation där en person har ringt in och du har velat förmedla den informationen till folk som är i närområdet var personen ringde in?
    - Kan du berätta om den situationen?
    - Hur upplever du att en sån situation hade kunnat förbättras?

- Hur avgör du att det som personen rapporterar in är tillräckligt sant för att du ska skicka en resurs till den situationen?

- Verifierad information?
    - Vad skulle få en operatör att känna att detta är tillräckligt sant/verifierat för att det skall kunna bli ett meddelande till alla inom ett visst område?
    - Vilken situation skulle kännas relevant nog att kunna skicka ut ett VMA för? Påverkar allvarligheten? Storleken på område som berörs? (jmfr info till alla i ett kvarter vs alla i Göteborg)
    - Inställning från RL och Operatörer: Går det tillräckligt snabbt i dag? (kanske inte ens värt att fråga)

Till handledare för nya operatörer

- Hur tar de största osäkerheterna sig i uttryck hos operatörerna? Dvs vad är de osäkra på när de är nya?
- Finns det något som minskar osäkerheterna?
- Finns det hjälpmedel för att nya operatörer skall bli mer säkra i sin roll?

Appendix VI - Interview with NL-Alert

Goal: Evaluate CB through an interview with the NL-Alert
Find out how CB could be implemented in Sweden, and suit our stated needs and demands.

- ***Why did they choose Cell broadcast technique, what other options did they consider?***
- ***How is their system built?***
- ***What kind of messages do they broadcast, in terms of severity and proximity?***

About the interviewee:

- **What company are you working at currently and what's your role?**
    - **Is this the same as when you were(/still are maybe?) involved in NL-alert system?**
    - **How is that connected to the NL-alert? (e.g figure out who are involved in the alert system, who owns it etc.)**
- **What was your role in the NL-alert programme?**
    - **And were you part of the whole project, from initiating to implementing NL-Alert?**

About Cell broadcast (tech):

- Can you tell us what steps there is in the process to send out an alert message?
- Why did you choose Cell Broadcast technique?
    - What other options did you consider?
- Who will receive NL-alert, what requirements is there for a user to get the message to their phone?
- How many percents of the population are you expecting to reach with NL-alert?
- What network does the system use? (2g - 4g?)
- How long time does the system need to send out messages to recipients?
    - E.g 1000 messages in xx seconds?
- Can you track how many receivers there are?
    - What does the tracking show? Who has confirmed the message or sent?
- In your system, is it possible for you to send out alerts with different urgency levels?
    - If yes, how many, and why those?
    - If yes, can it be used in a way where the urgency level decreases when proximity to the event decreases?
    - If no, why not?
- How do you see the operational safety with the system?
    - What are the opportunities considering safety
    - What are the risks?
- Does the system store information of who sent out the message, who demanded it and etc?

Usage of Cell Broadcast:

- Can you tell us how it looks and works for a person receiving an NL-alert?
    - If they have different levels of emergency and urgency, how does it differ?
- *To what extent will NL-alert be used?*
    - *National, regional, local?*
    - How severe does a situation have to be for an NL-alert to be distributed?
- When the public has received a message, what do they have to do?
    - E.g click ok?
- Can they find the message again somewhere?

- What if the conditions change, do you update the information in some way?
    - How does this look for the end user?
- When the danger is over, how will this be communicated?
- What if a person moves into the area where an alert message already has been sent out?
- What language are you broadcasting?
    - Why this? Possibility to broadcast several?
- How will the public be sure the information is verified and sent from an official source?

The content of the messages:

- What does a typical message contain?
    - Where, when, etc.?
- Are the messages specific for each type of event, or do you use one kind of message?
- Is it one message for all recipients or can the message differ between the recipients?
    - E.g different distance from the event?
- How long/short messages can your system handle?
- Do you provide any information where recipients can find more information if they'd like?
    - If yes, will that site be able to handle a large number of visitors at the same time? Or how will this be solved?

Other questions

- What were the main concerns from [see list below] before implementation, and how did you overcome them?
    - The government
    - The public
- Costs of implementation: Rough estimation?
- With hindsight, is there anything you think could have been done differently to improve the outcome?
- What would be the best way to be able to use the CB technique in your opinion
    - What situation, what scale,?

Appendix VII - Questions to Peter Sanders, One2many

Goal: Evaluate CB through an interview with Peter Sanders from One2many, a company providing CB. Find out how CB could be implemented in Sweden, and suit our stated needs and demands.

- *What possibilities are there to customize the CB/LTE B Technology suiting our needs?*
    - *Design content of a message*
    - *Technological possibilities and limitations*
- *What risks are there with the system?*
    - *Verified information*
    - *Information fatigue/advertisement*
- *Get an understanding of what the experience is for operators sending- and recipients of the message*

About the interviewee:

- What is your role at one2many?

About Cell broadcast (tech):

- Difference between LTE B and CB?
    - Who can get access to what? Companies vs governments
    - Is it possible to turn off either of them?
- What type of towers does the message broadcast through?
    - *Does one need an internet connection? For LTE? For CB?*
- What is required from recipients to be able to receive a message, apart from having CB enabled? Difference between CB or LTE?
    - Internet connection?
    - Position?
- The message is broadcast within a cell, and what determines the cell size? (e.g what type of (radio?)tower?)
- Using CB and LTE B, is it possible to send out messages with different urgency levels?
    - If yes, how many, and why those?
    - If yes, can it be used in a way where the urgency level decreases when proximity to the event decreases?
    - If no, why not?
- How do you see the operational safety with the system?
    - What are the opportunities considering safety
    - What are the risks?
- Does the system store information regarding who sent the message, internal tracking of a person etc.
- Can you tell us about wireless emergency alerts on small LTE cells? (We read on your webpage about this, but couldn't grasp the difference between LTE emergency alert and LTE broadcast)
    - What's the application for this technology?
    - How is that compared to Cell broadcast?
- Typical customers of [stated technology]
    - … CB?
    - … LTE B?

- How do their demands differ, if they do? What is the purpose of the service that they order?
- Cost of implementation? Is this a subscription service? Support?

Sending/receiving CB/LTE B:

- Can you tell us what steps there is in the process to send out a message? 9,30
- What does the interface look like for operators composing a message?
    - Send pictures for reference?
- Can you tell us how it looks and works for a person that can receive a message
    - If they have different levels of urgency, how does it differ?
- Turning off/on CB?
- Can recipients find the message again somewhere? (states no on their webpage, is this something that they're working on?)
- Is it possible to see how many the message will be broadcasted to? (states no on their webpage, is this something that they're working on?)

The content of the messages:

- How long/short messages can a CB and an LTE system handle?
    - Differences?
- LTE Broadcast can send media, such as pictures, is this possible for Cell Broadcast (If he stated that there is a difference between LTE B and CB)
    - Could one, for example, include a map?
- What technical possibilities are there to design a CB/ LTE B message?
    - What information can be included today?
    - What are future possibilities? Integration with other companies?
- How can the public be sure the information is sent from said source?
- How are CB messages of multiple languages designed?
    - Do composers have to compose one for each language?
- What options are there to design for recipients to confirm that they have received the message?
    - E.g click ok?
- If including an URL, would it be clickable?

Other questions

- What is your view on CB/LTE B used for Emergencies and Advertisement?
- What would be the best way to be able to use the CB technique in your opinion
    - What situation
    - What scale?

Appendix VIII - Intervjuguide för IT-avdelningen

Mål med intervjun:

- Förstå vilka kriterier de har arbetat med när de tog fram SMS-lösningen
- Om lösningen möter deras krav
- Vad är framtidsvisionen för SMS-lösningen?

Frågor:

- När ni började arbetet med SMS-lösningen, vad jämförde ni för alternativ?
- Varför valde ni SMS i slutändan?
- Möter SMS-lösningen de krav som ni hade på produkten?
    - Om nej, vad saknas?
- Hur är det tänkt att SMS ska användas?
- Vad är framtidsvisionen för VMA till mobilen?
- Hur tror du att möjligheten för att implementera en Cell Broadcast-lösning?
- Vad kostade smslösningen?

SMS (tekniska frågor)

- Hur precist är positioneringen för sms?
- Kan du jämföra det med CB?
- Mast vs gps, eller är det bara i masten?
- Prioriteras sms?

Appendix IX - Utvärderingsintervju SMS, App och CB

- Testa och utvärdera koncept i tidigt stadie
Syftet med intervjuerna är att få perspektiv till varför enkät och workshopdeltagare specificerar SMS som önskat sätt att få VMA.

1. Kort förstå vad viktig information innebär för intervjudeltagaren
2. Mappa ut deltagarens karaktärsdrag
3. prata om digitala lösningar
    a. Hur ser deltagaren på möjligheten till VMA via SMS?
    b. Egna erfarenheter? I Sverige, i utlandet?
    c. Upplevelsen: Officiellt, direkt, personligt, relevant?
    d. Om en hypotetiskt skulle få varningsmeddelanden direkt till telefonen, hur ser vederbörande på den möjligheten?

Upplägg
Namn och ålder?

Frågor för att kategorisera telefonanvändande, mediavanor och nyhetssökande

Fråga om telefonvanor/hur medveten är vederbörande om det skickas info till telefonen/nya notiser.

- I hur stor utsträckning använder du din mobil? (t.ex hur ofta under dagen, hur många olika sysslor gör du med den?)
- Har de ljudet på på telefonen? Varför, varför inte?
- Brukar du se på till exempel serier, filmer eller andra typer av inslag på tv/ streamingtjänster?
    - Streaming eller “klassisk” tv?
    - Svt play eller netflix?
    - Youtube?
- Hur får du nyheter? Hör i fikarummet, läser på sociala medier eller söker du efter nyheter via någon tjänst?
    - Nyheter från en mobilapp eller läsa i en tidning?
    - Nyheter från en digital tidning eller lyssna på tv/radio-nyheter?
    - Sociala medier eller att någon pratar om det i fikarummet?

------- Frågor om teknik och samhällsinfo -------

- Vad för information tycker du är viktig att få gällande samhället?
- Varför?

Viktigt meddelande till allmänheten skickas idag ut på SMS till ditt telefonnummer, baserat på din adress och/eller på din position.

- Vad tycker du om att få VMA via SMS?
- Varför?

- Hur upplever du det sättet att få information?
- Har du själv fått något SMS från SOS Alarm? (Eller utomlands? eller något annat snarlikt exempel på en myndighet som hör av sig via SMS? Tandläkaren?)
- Hur upplevs det?

Förutom SMS så finns det andra alternativ för att skicka information till mobiler, till exempel via en app

- Har du appar på din telefon?

En app skulle innebära att alla personer själva väljer att ladda ner den och skulle själva kunna ställa in vad, när och vilken typ av information de skulle vilja ha.

- Hade du laddat ner en app om SOS Alarm uppmanar dig till det?

Skulle du föredra att ladda ner en app framför att få ett SMS för att få information av SOS Alarm?

- Varför?
- Vad ser du för fördelar med ditt val?
- Vad ser du för nackdelar med ditt val?

Om du tänker på de två sätten, en app eller ett sms, vad upplever du som mer

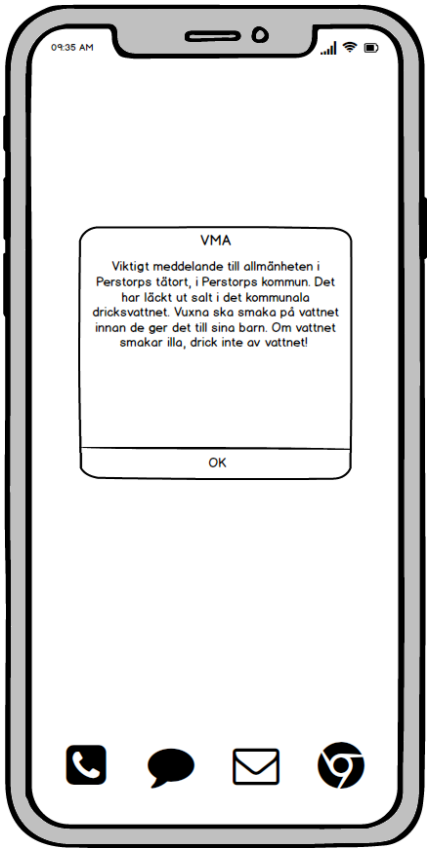
- Officiellt? → Varför?
- Brådskande? → Varför?
- Personligt för dig? → Varför?

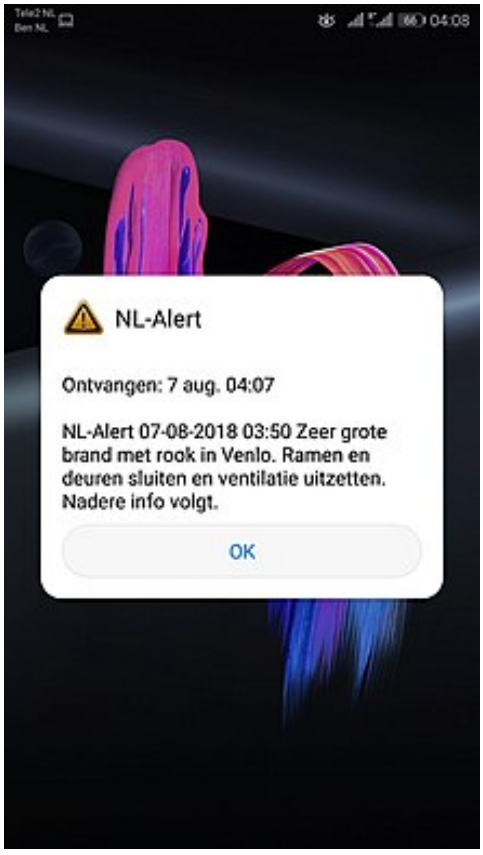
---------- Frågor om Cell broadcast ----------
Förutom SMS och att använda sig utav en app finns det en teknik som heter Cell Broadcast. Cell broadcast är en teknik liknar hur SMS fungerar idag förutom att det inte använder ditt telefonnummer och därmed inte din adress.

Cell broadcast skulle innebära att det skickas ut information till de som är i berört område och att meddelandet presenteras på skärmen ungefär som den här bilden (*Visa prototyp)*. Det skulle också gå att använda olika signaler för Cell broadcast meddelande, till exempel kan det låta även om mobilens ljud är avstängt eller skicka meddelanden med olika nivåer av brådskande information.

- Hur hade du upplevt att få information skickat till dig på det sättet?
- Vad uppstår för frågor med denna lösning?
- Vad kan du se för möjligheter/fördelar med en sådan lösning?
- Vad kan du se för nackdelar med detta?

Tycker du att vi borde ha frågat något som vi inte gjorde?


09:35 AM
VMA
Viktigt meddelande till allmänheten i Perstorps tätort, i Perstorps kommun. Det har läckt ut salt i det kommunala dricksvattnet. Vuxna ska smaka på vattnet innan de ger det till sina barn. Om vattnet smakar illa, drick inte av vattnet!
OK


NL-Alert
Ontvangen: 7 aug. 04:07
NL-Alert 07-08-2018 03:50 Zeer grote brand met rook in Venlo. Ramen en deuren sluiten en ventilatie uitzetten. Nadere info volgt.
OK

Appendix X - Evaluation of Ideas

Evaluation of Ideas							
Ranking ideas on a scale from 0-5, where 0 does not fulfill the requirement, and 5 fulfills the requirement completely							
No.	Specification	**Idea 1**	**Idea 2**	**Idea 3**	**Idea 4**	**Idea 5**	**Idea 6**
R1	Work on smartphones	5	5	5	5	5	5
R2	Provide information at a fast pace	3	5	5	5	5	5
R3	Possible to reach users, even if network is congested	3	0	3	3	3	0
W1	Being able to find information again	3	5	4	4	4	5
R4	Better coverage than TV and radio (40%)	5	1	4	4	4	1
R5	Alert recipients at different urgency levels	5	5	4	0	0	5
W2	Update information	0	5	4	4	4	5
R6	High data security	3	3	3	3	3	3
R7	Send location-based information	5	5	5	5	5	5
R8	Information is situation specific	5	5	5	5	5	5
R9	Recipient experiences to be affected by situation	5	5	5	5	5	5

R10	Be informed about when the danger is over	4	5	4	4	5	5
R11	Receive required action	5	5	5	5	5	5
R12	Understand level of urgency	3	2	3	5	5	3
R13	Understand that information is sent from an official information source	-	-	-	-	-	-
W3	Message is perceived as trustworthy	5	5	5	5	5	3
R14	No action required to receive information	5	0	3	3	3	0
R15	Always be notified of important information	5	2	2	2	2	2
W5	Ensure source where recipients can find more information	-	-	-	-	-	-
``	Refer to where recipients can find more information	5	5	5	5	5	`
Score (100 in total)		**74**	**68**	**74**	**72**	**73**	**67**

Appendix XI - Frågor till KBA, andra besöket

Målet är att tydligare förstå deras roll i VMA-kedjan. Hur skulle en KBA:are kunna använda sig utav informationszoner och vem borde ta beslutet om nivåer?
Hur relationen mellan KBA och RL/RÅ kommer även att undersökas
Vilka krav har KBA på informationen innan de skickar ut den?
Frågor

KBAs arbete Krisberedskapssamordnare

- Vad är dina arbetsuppgifter under en vanlig dag?
- Hur många VMA skickas ut per månad/år/vecka (vad som är mest relevant att räkna på)?
- Kan du beskriva hur processen går till från det att du för första gången hör att det är prat om att skicka ut ett VMA tills du är klar med ditt jobb?
- Är det något steg som är extra svårt/kräver mer av dig
- Hur lång tid tar en sån här process cirka?
- Upplever du att hela kedjan går snabbt nog idag?
    - Varför?
- Vilket steg skulle du säga tar längst tid idag?

Information:

- Vad för information önskar du att den som begär ett vma skulle kunna ge vid ett samtal för att du ska kunna hjälpa dem på ett bättre sätt?
- Vilka regler följer ni när ni komponerar ett informationsmeddelande?
    - T.ex plats, handling, förväntad tid?
- Hur skulle det kännas att skicka ut något som inte följer de reglerna?
- Hur upplever du sättet att skicka ut information idag?
    - Via radio och tv?
    - Vid utskick av SMS?
    - Att skicka ut saker som inte är VMA:
- Om man skulle använda temperaturfrågorna?

“Framtidens VMA”-frågor

- Hur skulle du vilja att SMS-funktionen skulle tillämpas på VMA?
- Vad hade du velat kunna skicka ut för meddelanden? (här tänker vi även om det inte är vma eller om det ska skickas ut lokalt)
    - Skulle det vara aktuellt att skicka ut olika information till olika delar?
- Finns det något steg i processen där det hade kunnat gå att samla infon som finns för att skicka ut detta när det behövs?
    - Till exempel: använda temperaturfrågorna som 112orna har för att klassa hur pass allvarlig händelse det är, hur skulle det kunna användas för er för att t.ex kunna ge indikation om att ett VMA skulle kunna skickas ut lokalt i det området?
    - När är det nog mycket info?

Appendix XII - Service Design Blueprint