Intelligent SMS as an Effective Public Warning System: the Inspiring Results of a Dutch Pilot Project

Marnix W.B. Eysink Smeets
Independent consultant/
Partner Citizen Alert Services
m.smeets@citizenalert.nl
marnix.eysink.smeets@xs4all.nl

Simone Sillem
PhD Researcher, Risk Centre Delft University of
Technology
S.sillem@tbm.tudelft.nl

ABSTRACT

The classic Dutch disaster-warning system (the 'siren') is not as effective as it should be. The alarm is not heard by 37% of the population, not all the people that hear the siren do take it seriously. A public-warning system was developed based on so-called 'intelligent SMS'. This system was tested in 2004 among 700 inhabitants of the city of Vlaardingen (region Rotterdam-Rijnmond). The University of Delft conducted an intensive evaluation. The evaluation shows that use of SMS is technically feasible. It diminishes the part of the population that is not reached is by approx. 50%. The public is now not only warned that 'something is going on' but is informed by SMS of the nature of the threat ánd on what to do. The public perceives intelligent SMS as the most effective warning system. Based on the pilot, the disaster-management authority of the region Rotterdam-Rijnmond, with some 1.2 million inhabitants, decided to structurally implement the system in the whole region in 2005.

Keywords

Public warning system; SMS; Rotterdam-Rijnmond; Vlaardingen; Citizen Alert Services; CAS; Research; Pilot; Evaluation; effect; Risk Centre TU Delft

INTRODUCTION

During many incidents in The Netherlands in recent years it became more and more apparent that the existing public warning system is not as effective as it should be. The system comprises of computer-steered sirens placed on strategic places all over the country. During more than one incident it became clear that a large part of the public does not hear the sirens. But it also turned out that people who do hear the siren do not take it seriously or act in exactly the opposite way of what is meant. Research shows that on average 37% of the population do not hear the siren (de Hond, 2003) and that 61% do not know what to do when the siren was sounded (Sillem et al, 2004). By nature the siren can also not be heard by the 125.000 complete or partially deaf people in the Netherlands. The Dutch ministry of the Interior therefore promised Parliament that a special warning system for this group would be implemented by 2003, but failed to live up to this promise.

Seeing this, a Dutch disaster-specialist, a marketing-specialist and the largest provider of mobile messaging services in the Netherlands teamed up and combined their expertise. They formed a new company, Citizen Alert Services, with just one goal: to develop a better public warning system, based on a clever use of SMS. Penetration of mobile phones is as high as 84% in the Netherlands, coverage is good in the whole of the country and the use of SMS is well known and widely accepted. In major tele-voting events it had been proven that safe, time-critical SMS is possible in high-volumes without congestion problems, when it is designed and executed well.

THE SYSTEM

A system was developed, based on so-called 'intelligent SMS'. In this system, a sophisticated database is combined with a very stable, high-speed, high-capacity SMS Platform. This is placed as a spoke-in-the-wheel between all the (6) providers of mobile communication in The Netherlands. The system is a so-called dedicated mGovernment-system, for safety and reliability purposes strictly separated from the normal commercial SMS-traffic.

The Netherlands have a widely known and widely accepted postal-code system. This divides the whole country in very small cells, of on average 1.500 inhabitants. Almost every Dutchman knows his or her own postal code. It is this coding system that is the 'default-setting' in the SMS-warning system. People that would like to be warned by SMS in case of danger register the postal codes in the system of their home, their work or school, the school of their children. This is done in a very easy way by SMS or by Internet. In the database the combination of postal codes and relevant Mobile telephone number is stored (even when people switch provider). All kinds of coding can be used however. For instance,

special codes can be used for specific professionals, like schoolteachers, shop-owners, doctors in specific areas: they can receive warnings and instructions that differ from the warnings for the general public at the same time.

The local authority has an interface, in which all the geographic and professional selections can be made by a mouse click. The most common warning messages are prepared in advance and can also be selected with the click of the mouse when needed. The preparation of the messages is done to prevent mistakes or the sending of unclear messages in the hectic first moments of an incident. In preparation is an automatic combination of the use of the siren and the SMS-system, to minimize the amount of actions that have to be taken.

The system can send different types of SMS-messages. For urgent alarms the so-called flash-message (or 'type-0') messages are used. These high-priority messages can hardly be missed because they, other than normal SMS-messages, pop-up directly on the main screen of the receiving mobile phone. They can also not be faked by the normal Mobile telephone user, so the chance of false alarms is minimized.

The way of operating of the system is shown in the figure below:
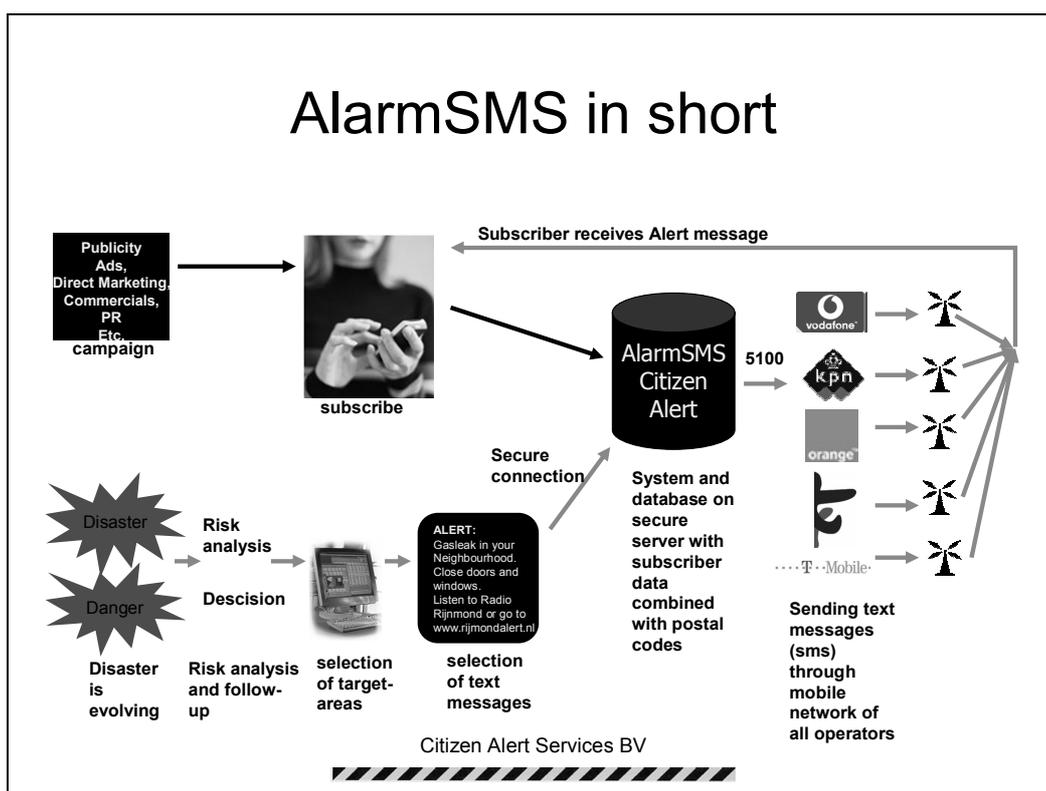
THE PILOT

After the development of the system and thorough internal testing the system was tested in 'real life'. The municipality of Vlaardingen, a city of some 65.000 inhabitants in the Rotterdam-Rijnmond region was very eager to test the system: the city is surrounded by heavy industry and harbours and had experience with recent incidents in which the siren warning had not had the expected effect. So the city of Vlaardingen and the regional authority for disaster management (the "Regionale Hulpverleningsdienst Rotterdam-Rijnmond") commissioned and financed a wide-scale test.

The pilot started in the fall of 2003 with a planning and design phase of 4 months. In these months, a bill of requirements was drafted for the specific circumstances in the Vlaardingen-region. The system was then customized to meet these requirements. The procedures and protocols were designed for an efficient use of the system by the authority for disastermanagement and the relevant staff was instructed. A research-design was made for the evaluation (see below) and a representative testgroup was composed.

The actual test was run from February till June 2004. More than 700 people from Vlaardingen participated. Within this testgroup were segments of inhabitants from all of the neighbourhoods in the city, segments of deaf inhabitants, different groups of professionals et cetera. In the test-period the participants received an SMS-warning around the time of the monthly siren-test (the siren is sounded in the whole of the Netherlands once a month to test the system and to keep people aware) and on two occasions unannounced at different times during the week. In the test-messages people were

asked to respond by SMS, to see whether they indeed had received and read the message, they were also asked whether they had heard the siren at the same time.

THE EVALUATION

'Self-evaluation is deemed to lead to succes' is a well known quote from Wesley Skogan. Therefore Citizen Alert Services asked the Risk Centre of Delft University of Technology to conduct a thorough, independent evaluation.

The pilot was based on the assumption that (a) it was technically feasible to warn relatively large groups within the population by SMS within a very short time, (b) the combination of alarm by siren and alarm by SMS would significantly reduce the part of the population that was not reached by the standard alarm alone, (c) AlarmSMS would be considered by - at least a reasonable part of - the population as a good way to be alarmed and (d) that the authorities for disaster management would consider the AlarmSMS-system a practical, useful and cost-effective tool in their operations. The evaluation was designed in such a way that these assumptions could be tested for their validity.

The evaluation consisted of desk-research, two surveys (ex-ante and ex-post), response-analysis, interviews and (3) panel discussions with different segments of participants. The evaluation resulted in the TU-Delft-publication "Evaluation of the Pilot SMS-Alarm Vlaardingen" (Sillem et al. 2004).

THE RESULTS

Response-analysis showed that on average 79% of the warned group responded to the SMS-warning. The system checks by itself whether an SMS-message is actually delivered, this showed that 100% of the messages were delivered as intended. But being delivered doesn't mean that the message is also read: therefore only the responses are counted as effective delivery: to respond, people have to have read the message first of course. But the response of 79% is the minimal score for 'having read the message': the survey shows that not all participants have responded to all the messages they have read, and they also did not always respond immediately. The response time is given in the chart in the next page. Overall 58% of the target group responds within 10 minutes, which means they must have read the message earlier than that. As said, the survey (ex-post) shows that not all participants have responded immediately after having read the message.
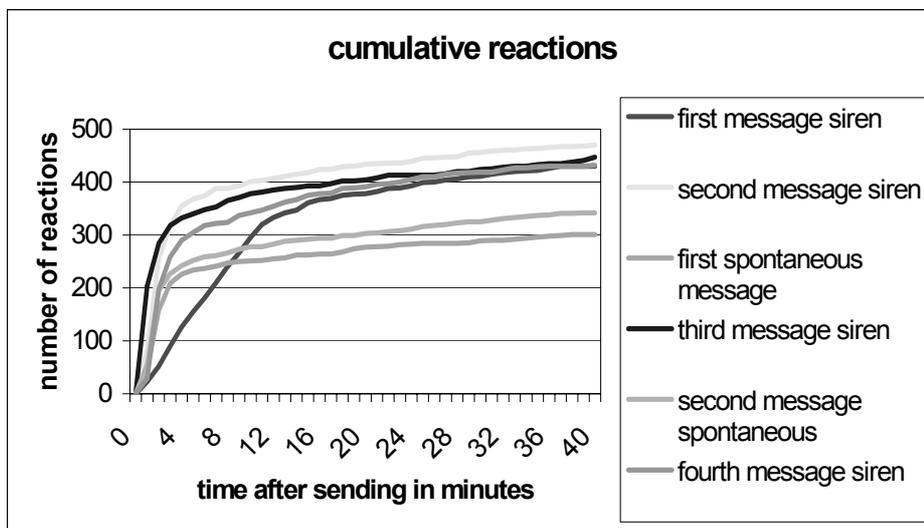
Combined coverage by SMS and Siren

The SMS-warning system is – in Holland - meant to be used in combination with the Siren system. In this way, a multimedia warning system is created. There is some evidence that there is a relation between 'reading the SMS' and 'hearing the siren' and vice-versa. People who have read the SMS have more often heard the siren as well and people who have heard the siren have more often read the SMS. This can be due to a higher sensitivity due to participating in the pilot, but it is not impossible that this is a structural effect.

The evaluation shows that among the participants in the pilot, the group that is not reached by the public alarm is diminished by approx. two-thirds. The siren alone does not reach 33% of the participants (slightly less than the Dutch

average), with the combination of SMS and siren this group is reduced to 11%. This amount should be corrected for mobile telephone-penetration, time of effective reading et cetera when generalized to the population as a whole. But then still an improvement of approximately 50% remains. Of the same importance is the fact that 79% of the population is now not only notified that 'something is wrong', but they are now informed on the character of the threat ánd they are given instructions for action at the same time.

		AlarmSMS	
		YES (79%) (Did respond, so must have read)	**NO (21%)** (Did not respond, so *maybe* did not read)
Siren	**YES (67%)** (Did hear siren)	57%	10%
	NO (33%) (Did NOT hear siren)	22%	11%

Table 1: coverage by SMS and siren

Public acceptance

95% of the participants in the pilot consider SMS to be a good or very good addition to the siren warning. 84% has the idea that they will be better warned by the combination of the two systems than by the siren alone. When asked which form of warning they would like to see, the Alarm SMS turned out to be the most popular warning system, which is mentioned by 91% of the research group, followed by to 82% for the siren and 63% radio.

Performance

Apart form a few start-up problems in the first few weeks of the pilot the system performed as planned. These problems arose from a feature that was at the last moment added to the system for the pilotphase only: an automatic timer that could be used to deliver the monthly test-alarm automatically. After this timer was eliminated from the system the system performed flawlessly. The pilot-experience further gave ideas for some improvements in the field of user friendliness of the interface that is used in the controlroom of the authority for disastermanagement.

Professional acceptance

Both local authority of the municipality of Vlaardingen and the Regional Disaster management-authority were very pleased with the performance of the system and the results of the evaluation. Based on the evaluation, the Board of the Regional Disaster management-authority has decided tot implement the system in the whole region with urgency. This means that the system will become operational in the whole region in the spring of 2005. Some other municipalities and regions will follow shortly after. At the moment of writing, a projectplan is made up for the implementation of the system in the whole region as well as a bill of requirements for the system in the implementationphase. No major improvements were necessary, based on the evaluation, but much attention is given to the way the costs for the (running of) the system will be divided between the authority for disastermanagement and the members of the public that want to make use of the system. The authority for disastermanagement will install the system and pay for alarmmessages on one postalcode per participant (which in total costs no more than a few eurocents per inhabitant per year). Participants that would like to be informed in more postal codes will pay a small yearly fee for these extra postal codes themselves.

VARIATIONS

Due to the success of the pilot, variations on the system are now developed for specific other purposes in the public-safety-sector. For some institutions that have a high-risk-profile for terrorist attacks, a smaller-scale warning system is developed with which users of that institution can be warned in a few seconds to evacuate or to stay away. The same is now under development for business parks or dangerous industry. The system will soon also be capable of spreading so-called regional weather-alarms, with which the population will be warned for specific, dangerous forms of weather, like gale force winds.

Studies are now also under way what contribution a system like this could give to the prevention of disasters like the recent tsunami-disaster in Asia. Because if a tsunami-warning system (to detect the waves) is in place, the question still remains how the information can be spread in the quickest way. An Alarm SMS-system will *not* easily be capable of warning all the millions of threatened inhabitants within an acceptable time (this surpasses its capacity), but *is* capable of informing all the key-professionals in all the cities and villages along the threatened coastlines in a very short time, wherever they are.

CONCLUSION

Due to the wide-spread proliferation of mobile phones, mobile messaging seems to be an interesting way to warn the public for upcoming dangers. Most people have their mobile phones with them, wherever they go. That they switch off their phones during some of the time is not a big problem: to get a warning message across, 100% coverage is not absolutely necessary. Because in case of real danger, people will share information with others in their vicinity. But in that case it helps that people know what the threat is and what behaviour is advisable.

The Vlaardingen pilot showed that public warning by 'intelligent SMS' can reduce the amount of people that is not reached by the existing warning systems and that it can provide the public with information on the nature of the threat and the necessary action. The system is seen as effective by the public and by the responsible authorities, structural implementation is welcomed. The system can also be used for more specific warnings in specific target groups, more specific risks or more defined areas.

ACKNOWLEDGMENTS

REFERENCES

1. Hond, M.d. "Hoorbaarheid Sirene". *In Dutch.* 2003

2. Sillem, S, E. Wiersma, B. Ale, with cooperation of M. Eysink Smeets *Evaluation Pilot SMS-Alarm Vlaardingen,* Delft University of Technology, Delft, The Netherlands 2004, Risk Centre report number 200410001

3. Vos, J. en F.W.M. Geurtsen. Een laboratoriumstudie naar de hoorbaarheid van sirenegeluiden. TNO Technische Menskunde. Soesterberg, The Netherlands, 2003 *In Dutch*