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MOBILE EMERGENCY NOTIFICATIONS: COMPARISON STUDY ON EXISTING APPLICATIONS

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***Abstract:** Many events have occurred over time that have jeopardized people's safety. In the past, traditional security measures were used to deal with similar scenarios, but they proved ineffective and unreliable. Many people have become victims, primarily because they were able to get help in an emergency. The authors made a critical analysis of the existing applications on the market, identified the weak points and made constructive proposals for the developers of mobile applications.*

***Key words:** mobile emergency, application, emergency communication, mobile notification, comparative analysis.*

1. INTRODUCTION

The definition of an “emergency” covers a multitude of critical situations, from events involving a single participant, such as health problems, murders, robberies, to events involving more than one person, such as fires, road accidents, natural disasters, terrorist attacks or similar situations. Regardless of the type of such an event, the common denominator is the need for those involved to contact the emergency authorities directly to receive the necessary help and useful advice. To best manage the reported case, operators in emergency dispatches are always looking for clear and real information. They may only send the right resources if the information provided is correct and relevant [1, 2].

To understand precisely what communication means during an emergency, we have consulted the definitions imposed by the European Commission in the European Electronic Communications Code [3]. Article 2(38) defines emergency communication as “a communication made through interpersonal communications services between an end-user and a PSAP for the purpose of seeking and receiving emergency assistance from emergency services”.

In recent years, emergency mobile applications have been used in the transmission of alerts and emergency notifications. By using them, mobile applications can facilitate communication during emergency situations, with telephone lines remaining available exclusively to response teams. They can support intervention teams for better coordination before, during and after the disaster.

Currently, one of the most problematic issues in the field of emergency management is the notification system in such situations, as regards obtaining accurate information in the early stages of the event and how to notify the affected persons. The researchers observed that to improve the management of crisis events, specialists could rely on the collaboration of citizens directly involved in the event, believing that they can act as “human sensors” during an emergency [4].

2. COMPARISON ANALYSIS OF EXISTING EMERGENCY MOBILE APPLICATIONS ON THE MARKET

In recent years, mobile applications for emergency communication have developed at a fast pace providing support to users in various situations such as road accidents, natural

disasters, health problems, or dangerous circumstances. The results of the use of emergency mobile applications are excellent, providing accurate and accurate information to operators in emergency dispatches [1].

In the studies conducted it has been shown that alerts from mobile emergency applications can reduce the total duration of the call by shortening the call time, the time the call is taken, the time it takes to get details of the address and the description of the event. In short, if the mobile app alert can answer the two relevant questions “What happened?” and “Where did it happen?”, emergency response teams can intervene faster at the event site [2].

However, at present, existing emergency mobile applications are only accessible in the region where they were created, which can discourage both citizens and competent authorities. According to the European Emergency Number Association (EENA, en. The European Emergency Number Association), an emergency mobile application should be available throughout the European Union (EU). This is the main reason why EENA advocates that all emergency mobile applications operate in a standardized way across the EU and comply with a pan-European standard [5].

However, the great topical problem of these systems is related to the reliability of information, since anyone can post anything, they want, which is why work is now being made to develop systems that prevent the spread of false information [6, 7].

Although the mobile app market is growing at a fast and continuous pace, mobile solutions designed to communicate during emergencies face significant barriers that prevent their improvement and adoption on a larger scale. These obstacles include:

- Low awareness of emergency mobile applications;
- Lack of regulations in the field;
- Lack of specialized literature.
- Data privacy and security issues.

Despite current limitations, the market for mobile emergency solutions is rapidly evolving, with the major potential to improve the

emergency management system. Future developments in the field include, inter alia:

- Defining international standards and regulations.
- Integration of mobile solutions into the emergency system.
- Promoting emergency mobile applications.

The Pan-European Mobile Emergency Apps (PEMEA) project, carried out by the European Emergency Number Association (EENA), demonstrated that emergency mobile applications can provide citizens with intuitive and faster access to emergency services by providing essential information such as: pre-recorded data by the user (name, data relating to known health conditions), telephone number, precise location of the user, images or sounds recorded from the event site [5].

In addition, it has been proven that an emergency mobile application allows all citizens, including those with disabilities, to alert the emergency dispatcher when a critical situation occurs and to automatically transmit the necessary information to the nearest emergency dispatch [5].

2.1 PEMEA Project

The EENA has begun implementing a European policy for emergency mobile applications. The objective of the PEMEA project is to provide European citizens with the possibility to install a single emergency mobile application, available throughout the European Union, easy to use and which, at key moments, can provide to the nearest PSAP [8]: user identification data, the exact location from which the request is submitted and a brief description of the event.

The simplified flow of a request submitted via an application operating according to the PEMEA standard is as follows:

1. The mobile application sends the emergency request to the PEMEA server. The request will contain the following data: phone number, name, language of the user, exact location.
2. The server receives and distributes the urgent request to the PSAP service provider. PSAP Service Provider - PSP) to which it is connected. It determines the next routing

step in the PEMEA network based on the user's location.

3. submitted through the application are received by the nearest PSAP.
4. If the operator in the PSAP dispatcher wishes to connect with the user, the operator may establish the communication by various means: voice, data, video call, multimedia packages (sound, images).
5. The PEMEA network nodes will ensure the uninterrupted continuation of the established communication channels until the end of the emergency.
6. PEMEA network nodes will ensure a stable and secure connection so that any messages from non-PEMEA entities are rejected.

The first phase of the PEMEA project involving eight participants took place between June 2018 and March 2019, and the findings of the study revealed that the PEMEA project has the capacity to provide:

- For citizens: roaming access to emergency services across the European Union via the local emergency mobile application developed in the home state of users;
- For PSAPs: relevant information transmitted through a standardized application (e.g., exact location, caller language, contacts, user details, call tracking) so that emergency teams can intervene as soon as possible.

In the second phase of the PEMEA project, which ran from November 2019 to May 2020, EENA's main goal was to integrate and interconnect all the applications analyzed in phase I of the project with the emergency dispatchers (PSAPs) roaming. The results of this study showed that the PEMEA network can provide the necessary infrastructure for emergency authorities (PSAPs) to connect with people seeking help, roaming, anywhere in Europe. Furthermore, the experiment showed that users of emergency mobile applications were able to contact the nearest PSAP connected to the PEMEA network using the local emergency app installed on their device. In this phase of the project, seven participants were involved. Thanks to the PEMEA project and the newly created infrastructure, eight dispatchers (PSAPs) in Europe and twelve emergency mobile applications have been validated with the

PEMEA standard. The PEMEA network is an ever-growing environment, ready to integrate other new mobile or emergency dispatch applications in Europe, thus facilitating simplified access to emergency services for all citizens of the European Union.

2.2 Adjacent mobile applications

Agencies providing emergency services together with mobile app developers have worked hard to provide the necessary mobile solutions. Currently, several mobile apps are available in major mobile app stores to help people involved in disasters as well as emergency managers. From these, we have selected a list of the most relevant of them. It should be noted, however, that these applications are currently not accredited by emergency services.

- Show Me for Emergencies is a mobile application designed for states of emergency and people with communication needs, such as difficulties in understanding English, hearing disorders or cognitive disabilities [9];
- RRAIN is a post-disaster response and recovery application designed to help people in charge of emergencies access relevant disaster resources and information, in real time, directly from a mobile device with [10];
- The CDC provides health and safety information on emergencies and natural disasters [11];
- FEMA provides information on natural disasters to government agencies, and assists in crisis response, planning, recovery and mitigation tasks [12];
- Red Cross Emergency is an application that combines more than 35 servers with weather alerts and emergency alerts, from natural to artificial ones, providing users with real-time information about incidents to occur near their location [13];
- First Aid provides advice, rescue instructions, and instructions to help survive everyday emergencies and natural disasters [14];
- Disaster Alert provides access to information about current dangers around the world. It sends notifications to the user about future hurricanes, tropical cyclones, tsunamis, floods, storms or fires [15]

- RW Crises offers real-time visualization of the latest humanitarian actions and global disaster trends [16];
- SirenGPS is an application that allows calling the emergency number “911” by touching a single red button present inside the app [17];
- Kinetic Global provides an emergency response faster than a call to emergency numbers “911” or “112” [18];
- The Noonlight app provides rapid emergency response via a button available in the app, also providing notifications of traffic accidents [19];
- Motorola Alert allows people to be contacted quickly in the event of a crisis [20];
- Sign Alert is a mobile application for declaring states of emergency and extreme phenomena [21];
- ELERTS See Say is a two-way incident reporting system to improve global safety and security [22];
- My112 is a Spanish application that, in case of emergency, can make a call to the emergency number “112”, and the PSAP operator will receive the emergency call along with the user’s location [23].

The comparison of the functions offered by these applications is shown in Table 1.

3. CONCLUSION

In emergency situations, the information transmitted is the key to resolving the crisis, help, and the intervention of rescue teams. Emergency communications is a mode of communication by which the information required by the PSAP is transmitted through both classical voice and text messaging communications services, or other types of communications such as video calls or mobile applications.

For these reasons, mobile app developers have begun to investigate these opportunities, and due to the growing demand, various online or mobile platforms for disaster management have emerged.

So far it has been proven that mobile apps can support people in critical situations and improve emergency management due to their ability to provide the exact location and personal information to the user in a very short time.

The critical analysis of emergency mobile applications on the market reveals that alerts from emergency mobile applications can reduce the total call duration by shortening the call time, the time the call is taken, but also the time it takes to get address details and event descriptions.

Table 1

Comparison of existing applications usable in emergency situations.

Adjacent mobile applications	Media	Text	GPS	Call	Map	Alerts	Reporting	Interface
Show Me for Emergencies		x				x	x	Complex
RRAIN		x	x			x	x	Complex
CDC		x				x		Complex
FEMA	x	x	x		x	x	x	Complex
Red Cross Emergency	x	x	x		x	x	x	Complex
First Aid	x	x	x			x	x	Complex
Disaster Alert	x	x			x	x		Simple
RW Crises	x	x			x	x		Complex
SirenGPS	x	x	x	x	x	x	x	Simple
Kinetic Global			x	x	x	x	x	Simple
Noonlight	x	x	x	x	x		x	Simple
Motorola Alert		x	x	x		x	x	Simple
SignAlert	x	x	x		x	x	x	Complex
ELERTS	x	x	x	x	x	x	x	Simple
My112			x	x	x	x	x	Simple

The research carried out reflects the need for innovation of the current emergency

management system, indicating the steps to be taken to improve the emergency management

system. Experiments with existing applications highlight some interesting things:

- Emergency mobile applications can have a positive impact on the current systems used for emergency notification. The actual utility of a mobile system lies in the emergency dispatcher's ability to handle multiple notifications simultaneously with a single operator available. In addition, the content of the notification is more accurate and detailed than that provided by a traditional call;
- The emergency mobile applications presented were accepted by the users who participated in the experiments. Most users surveyed said they would use such an application in a crisis;
- Mobile applications are especially suitable to inform emergency dispatchers about small-scale crisis situations but can also be useful in case of large-scale events;
- The most important advantage of these mobile applications is the ability to transmit multimedia information. During the experiments, the photos combined with the automatically taken position were the main sources of information;
- The level of accuracy of GPS embedded in mobile devices is considered appropriate by both experts and users;
- As regards the minimum information needed to create an emergency alert, the user's position combined with the user profile (e.g., phone number and full name) is sufficient as stated by the emergency experts interviewed. Storing personal information and automatically retrieving the device's position allows you to send an emergency notification in a single step, which eases the user's task;
- Users are irritated by lengthy tasks and do not pay enough attention in these situations, especially in emergency situations. Applications should have direct and fast navigation;
- The language of communication is important. For this reason, short and easy-to-understand labels and descriptions are needed;
- Confirmation of the request is a critical factor in the case of an emergency alert. Therefore, an emergency mobile application must be able to return a confirmation message on the

outcome of the application and decisions taken by PSAP operators.

Therefore, soon, it is expected that all Europeans, including citizens with disabilities, will be able to access emergency services wherever they are, using a regulated and harmonized mobile application at European Union level, and automatically transmit the relevant information to the nearest dispatches when a mobile alert is initiated.

Future research will be focused on investigating the possibility of using Artificial Intelligence in improving the current emergency management system functionalities [24, 25] also considering the modeling approach of supply chain in the context of sustainable development and circular economy [26].

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Notificări de urgență de pe aplicații mobile. Un studiu comparativ al aplicațiilor existente

De-a lungul timpului au avut loc multe evenimente care au pus în pericol siguranța oamenilor. În trecut, măsurile tradiționale de securitate au fost folosite pentru a face față unor scenarii similare, dar s-au dovedit ineficiente și nesigure. Mulți oameni au devenit victime, în primul rând pentru că nu au putut primi ajutor în caz de urgență. Autorii au realizat o analiză critică a aplicațiilor existente pe piață, au identificat punctele slabe și au făcut propuneri constructive pentru realizatorii de aplicații mobile.

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