The Functioning of the e-Call System in Poland Compared to Other European Union Member States

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Abstract:

Purpose: Increasing the safety of road transport is among important priorities of the European Commission's strategic operations. The implementation of the project of the Europe-wide e-Call in-vehicle emergency call system is an essential measure for achieving the objectives pursued in this respect. This paper presents general characteristics of that system, and its cooperation with the emergency notification system based on the Europe-wide emergency number 112. The author also presents a diagnosis of the use of the e-Call system, which sends information about help requests to emergency notification centres across the Republic of Poland and other European countries. During the research, the author used a method of source analysis based on source materials, including mainly legal acts and the academic literature. The research process relied extensively on synthesis, comparison, generalisation, reasoning, and abstraction.

Design/Methodology/Approach: The research was conducted with a method of source analysis based on source materials, including mainly legal acts and academic literature

Findings: The research analysis demonstrated that the e-Call system has a significant impact on the transmission of information about occurrences under current conditions, in particular the necessity to continue the implementation of solutions that ensure appropriate and fast transmission of information about occurrences. Due to the category of safety hazards in transport, the desired solutions apply to Poland and the entire European Union.

Practical implications: The issues discussed in this paper can help raise the awareness of users of the system regarding prompt transmission of information about occurrences and raise interest of various public bodies in further improvements of the system.

Originality: This paper discusses issues which now are particularly important to individual citizens and various bodies responsible for security, whatever their role in the society.

Keywords: e-Call system, emergency number 112, emergency notification system, e-Calls.

JEL codes: R410, R480.

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1. Introduction

The security of the country and its citizens is an important element of the functioning of every State. It is essential for a State to ensure security to its citizens. Whatever the existing threats, including ones to the public and general security, State structures should be prepared to counteract their effects. A State must establish appropriate structures that will ensure continuous care and protection to its citizens against threats to public and general security. An important role in ensuring security against threats to the public and general security is played by an emergency notification system.

The purpose of an emergency notification system is to enable fast as well as direct and universal access to public emergency services, inspection and fire brigade. Its aim is also to ensure appropriate flow of information so that necessary and effective help could reach those in distress in the shortest time possible. An important role in the functioning of an emergency notification system is played by system the in-vehicle emergence call system e-Call, which is a part of the European road safety programme and an important element of the European Union's telecommunications policy (Zirra *et al.,* 2020).

To function, the system requires installation of in-vehicle devices which automatically generate and sent information about road accidents, transmission of that information through a telecommunications network as well as support of emergency calls and dispatching emergency services to the accident scene. It is estimated that such a system will provide for a 40-50% reduction in the emergency call response time and a ca. 15% reduction in losses suffered due to road accidents (Piątek, 2009). These estimates substantiate the social and economic effectiveness of the e-Call project. From the telecommunications perspective, the e-Call project is being developed as an extension of the current location-enhanced emergency call system E112 (Rembalovich *et al.,* 2020).

The emergency notification system is based on the Europe-wide emergency number 112. It was established under a Resolution of the Council of Europe of 29 July 1991 (Resolution, 1991) and formalised under Directive 2002/22/EC of the European Parliament of 7 March 2002 (Directive, 2002), which was partially amended by Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 (Directive, 2009).

In accordance with the aforementioned Directives, Member States shall ensure that all telephone users, including public pay-telephones, can contact emergency services free of charge and via the single European emergency call number 112 and any national emergency number established by respective Member States (los Santos, 2009). Member States were also obliged to ensure that calls to the single European emergency call number 112 are appropriately answered and handled in the manner best suited to the national organisation of emergency systems.

Such calls shall be answered and handled at least as expeditiously and effectively as calls to the national emergency number or numbers, where these continue to be in use. (Szewczyk, 2018). At present, the emergency call number 112 functions in all EU Member States in parallel with national emergency numbers (e.g., 999 or 110).

Implementation of the e-Call system, which on the one hand would reduce the number of road fatalities and accelerate actions of emergency responders on the other, came as an important element in the functioning of the emergency notification system. Tens of thousands of people die on roads across the European Union every year (European Commission, 2020). It is estimated that 22,800 people died in road accidents across the European Union in 2019, a 2% decrease compared to 2018.

Although the 2019 road accident statistics were the lowest in history, the figure meant that 62 people lost their lives in road accidents every year (European Commission, 2020; https://ec.europa.eu/poland/news/200612_roads_pl). The European Commission estimates that a fully implemented e-Call system will reduce the emergency service response time by 40% in cities and by 50% outside built-up areas, which can translate into saving up to 2,500 of people in the European Union per year (European Commission, 2020; https://ec.europa.eu/poland/news/200612_roads_pl).

We also need to know that reducing fatalities and serious injuries by implementing e-Call in all EU passenger cars reduces the costs generated by road accidents. By implementing e-Call in all EU passenger cars, the costs of traffic jams and pollution caused by road accidents are reduced (Matwiejew *et al.,* 2018).

The beginnings of the e-Call system date back to the introduction of Directive 2010/40/EU of the European Parliament and of the Council on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport (Directive, 2010). Importantly, Article 3(d) of the Directive provides for harmonisation of the e-Call service in the European Union.

An important legal act that formalised the deployment of the e-Call system, Decision No. 585/2014/EU of the European Parliament and of the Council of 15 May 2014 on the deployment of the interoperable EU-wide e-Call service (Decision, 2014) requires in Article 1 that Member States shall deploy on their territory, at least six months before the date of application of the Regulation of the European Parliament and of the Council concerning the type-approval requirements for the deployment of the e-Call in-vehicle system and amending Directive 2007/46/EC (Regulation, 2013), and in any case no later than 1 October 2017, the e-Call infrastructure required for the proper receipt and handling of e-Calls (https://eena.org/mission-and-vision/).

2. Methodological Assumptions

The aim of the research was to present the use of the emergency number 112 and the deployment and functioning of the e-Call system in Poland compared with other EU Member States. Accordingly, the research problem was formulated as follows: What is the number of calls through the e-Call system in Poland and other EU Member States? This allowed the author to investigate the areas of knowledge that were necessary to present the possibilities of increasing the number of calls through the e-Call system with a view to improving the safety and functioning of the 112's emergency notification system.

The key role in the research process was played by the analysis of statistical data. The adopted methodology involved comparing statistics regarding the number of calls made through the e-Call system in individual EU Member States. The analysis covered the data for the period of the functioning of the e-Call system in Poland in 2018-2020 and in the European Union in 2018-2019 (no data has been published yet regarding the functioning of the e-Call system in European Union in 2020).

3. Functional Architecture

The functioning of the emergency notification system in Poland is regulated under the Act of 22 November 2013 on the Emergency Notification System (Journal of Laws 2013, item 1635). The system consists of emergency notification centres that comprise a single system for handling emergency calls to the numbers 112, 997, 998 and 999, which enables redirecting an emergency call to the relevant emergency resources. The e-Call system starts working during a collision or a road accident. Activated automatically after an accident, an e-Call device connects by means of an MSD message through a mobile telephony network to the Public Safety Answering Point (PSAP) appropriate for the area, enabling transmission of the electronic data of the car concerned (Szewczyk, 2018).

The device allows victims of an accident to activate the system manually by pushing a button inside the car. Witnesses to a road accident whose cars are equipped with the e-Call system also can report the occurrence to the Emergency Notification Centre by manually activating the e-Call device in their vehicles (Lis, 2018). An accident is detected automatically based on sensor values. When the boundary gravity force (acceleration) is exceeded on any axle of the vehicle, the system automatically sends a relevant message to the centre. A PSAP operator immediately calls the vehicle and tries to establish contact with either the driver or passengers to evaluate the situation on the accident scene.

In a crisis, the operator requests emergency services, indicating the location of the victims with a great accuracy (to 5 metres) (Kogut, 2020). The PSAP can be contacted also by pushing the SOS button on the system's remote control. This

allows the driver to request assistance to an accident or other occurrence he or she is a witness to (e.g., another accident, fire) (Lis, 2020).

Emergency calls are received by Public Safety Answering Points (PSAP), which serve as points for receiving accident reports. In Poland, PSAPs form a network of 17 centres (located in all Province capitals and in Radom) which handles E112 emergency calls. The waiting time for a 112 call to be received has been reduced, and the PSAPs receive such calls within 10 seconds on average. Earlier on, in the distributed system, the average waiting time was 28 seconds (Wałek, 2016). According to the assumptions made by the Polish Ministry of Digital Affairs, the obligation to deploy the e-Call reception points infrastructure in the EU imposed under a decision of the European Parliament was satisfied by Poland by 1 October 2017, and according to a report by the Ministry of Administration and Digital Affairs, the operating range of the E112 system covered the territory of Poland already in 2013 (Report, 2014).

4. Functionality of the System

Information about a specific situation provided by a person making an emergency call is a key problem as regards the functionality of the system. Emergency calls are categorised based on such information. The primary division of such calls is based on determination whether an intervention by emergency and public order entities is advisable or not and calls that do not require any response from the services are terminated. After all necessary information is collected, valid emergency calls are sent through a computer system to appropriate emergency and public order entities, and automatically change their status to "occurrences" (Lis, 2017).

The e-Call system is activated automatically, immediately after sensors in the vehicle register a serious occurrence (Kamiński and Nowacki, 2010). On activation, the system dials the European emergency number 112, connects with the appropriate PSAP and send the emergency services information about the accident, including the time of the occurrence, the precise location of the crashed vehicle and the heading (which is particularly important on motorways and in tunnels) (Nowacki *et al.,* 2014).

e-Calls can also be activated manually by pushing the in-vehicle button the car, by e.g., a witness to the accident. Every minute counts when emergency services are summoned to the scene to save lives and treat injuries. e-Call devices notify emergency services in not time, even when the driver or passenger have lost consciousness or are otherwise unable to call help. PSAPs handle e-Calls with at least the same efficiency and effectiveness as any other notification made to the Single European emergency number 112.

A PSAP process e-Calls in accordance with the requirements set forth in the national regulations on the processing of emergency calls (EN 302 665, 2010;

https://standards.iteh.ai/catalog/standards/etsi/48508e0f-3bbe-4f22-971e-4067dc430317/etsi-en-302-665-v1-1-1-2010-09).

A PSAP can access a relevant geographical information system or an equivalent system which enables the operator to receive e-Calls and determine the location and heading of the vehicle to the minimum degree of accuracy specified in EN 1572 (https://www.techstreet.com/standards/bs-en-15722-2020?product_id=2187380) for coordinates in accordance with MDS (Kamiński, 2009).

A PSAP enables relevant emergency services or partners to provide information on the location, method of activation of the e-Call system (manual or automatic) and other relevant data. If necessary, a PSAP can redirect notifications and MDSs (Minimum Data Sets) to another PSAP in accordance with applicable national procedures established by the national authority. Redirection can be done either by data transmission or audio calls, or ideally both (Nowacki *et al.,* 2014).

5. Detailed Analysis

The scale of utilisation of the emergency number 112 by the public can be determined by analysing calls to the emergency notification system. Information about the number of calls to the emergency notification system is provided in reports prepared by the Polish Ministry of the Interior.

PSAPs commended handling calls from the e-Call system from across Poland in 2018. In the first year of the functioning of the e-Call system, only a total of 264 e-Calls were recorded. The figure grew rapidly in the following year to 1,673 calls, reaching 5,418 in 2020 (Report 2019; 2020; 2021). As can be seen, the use of the system of notification of occurrences that require an intervention by emergency services grew dynamically. Applicable e-Call regulations entered into force during a reporting period. Member States were obliged to ensure that their PSAPs were ready to receive electronic calls from 1 October 2017 onwards.

Effective on 31 March 2018, car manufacturers should install in-vehicle 112-based e-Call systems in all new types in Category M1 (passenger cars) and Category N1 (light commercial vehicles). Since the applicable regulation applies only to new vehicle types subject to type approval - i.e., it does not cover all newly manufactured vehicles - its effects should be felt only from 2019 onwards. Data submitted by 26 Member States show that the e-Call system has been deployed (Communications Committee, 2020).

On analysing data for 2017-2018, one can distinguish a group of State where the percentage of calls through the e-Call system was significant - these States were Slovenia, Denmark, Spain, and Finland. States where the percentage of e-Calls was small include Bulgaria, France, Lithuania, Romania, and Croatia. The 2019 report shows the growth rate of emergency calls placed through the e-Call system. The data

was submitted by 26 Member States and Norway (Communications Committee, 2020).

On analysing data for the year 2019, one can distinguish a group of State where the percentage of calls through the e-Call system was significant - these States were Italy, France, Spain, and Bulgaria. States where the percentage of emergency calls made through the e-Call system was small compared with all emergency calls placed were Lithuania, Malta, Estonia, and Hungary (Communications Committee, 2020).

On analysing the above data for 2017 – 2019, it can be said that the number of road accident calls made through the e-Call system in the European Union is increasing year to year. The trend is likely to continue in next years, as more and more new cars fitted with the system appear on roads across the European Union. In EU Member States where the number of new cars sold is significant, one can notice an upward trend in the number of e-Calls placed compared with calls made by other means, e.g., 112 or national emergency numbers.

It is estimated that the e-Call system and its further development in the European Union could reduce the number of road fatalities by at least 2,500 per year (Nowacki et al., 2014). The deployment of the e-Call system should have a significant effect on reducing congestion caused by road accidents, thus leading to a general decrease in the congestion on European roads (Nowacki *et al.,* 2014). Nearly 3,000 people die on Polish roads every year. The annual cost of fatal accidents in Poland is over PLN 6.5 billion (Goniewicz *et al.,* 2017).

According to expert estimates, the e-Call system deployed in Poland can save as many as 350 lives a year, thus reducing the cost of accidents by nearly PLN 650 million (Goniewicz *et al.,* 2017). Compared with other EU Member States, Poland has a very high rate of accidents per million of residents (Goniewicz *et al.,* 2017).

However, in the case of Poland, further expansion of the e-Call system may be quite long and take even between 10 and 20 years. Fast expansion of the e-Call system in Poland is threatened by a relatively low rate of sales of new vehicles and putting them into service. Poles tend to buy used cars rather than new ones. Cars manufactured before 2018 will not be equipped with integrated emergency call system devices, and thus will not contribute to increasing the effectiveness of the system.

6. Conclusions

The deployment of the single Europe-wide emergency number 112, including the e-Call system, came as a response to the changing world and an effort to increase the level of safety of EU citizens. It also enabled several countries, including Poland, to improve their current emergency notification systems. The e-Call system is a comprehensive solution that ensures assistance in making an emergency call in the

event of an accident in every EU Member State. The use of the system enables faster transmission of information about the need for emergency services and the police to assist in each road occurrence (Lego, 2018). According to the European Commission, data on fatalities and heavy injuries in road accidents differ significantly from country to country and in terms of vehicle types responsible for a negative impact on outcomes of accidents (European Commission, 2020).

The e-Call system supports situational awareness, making activities such as monitoring, analysis and planning easier. Unlike other measures that have already been implemented to improve road safety, which help prevent accidents or increase the safety of people in vehicles (such as seatbelts, headrests, airbags), e-Call technology makes a significant contribution to improving the management of rescue operations immediately after an accident (Boniface *et al.,* 2019).

The best possible use of the expansion of the e-Call system requires focusing efforts mainly on those vehicles being registered that contribute to negative statistics of fatalities and serious injuries. In the European Union, a total of over 70% of road fatalities in 2019 took place in such countries as France, Italy, Germany, Poland, Romania, the United Kingdom and Spain (European Commission, 2020). Therefore, the system should expand fast in those countries.

Developing the e-Call system and ensuring its functionality have not been simple tasks and have taken more than a decade now. Therefore, the e-Call system should continue to develop and offer more state-of-the-art functions in the future. The far-reaching technological progress, on-going research and deployment of new solutions will allow providing increasingly better and modern tools to improve the system's functioning. However, humans with their awareness, knowledge, experience and will to help others will undoubtedly remain at the centre. Naturally, the framework of this paper has not shed light on all issues related to the functioning of the emergency notification system, including the e-Call system.

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