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MODERN SYSTEMS OF REPORTING ROAD INCIDENTS – ECALL SYSTEM AND ITS FUNCTIONING IN POLAND AND IN OTHER COUNTRIES OF THE EUROPEAN UNION

Abstract

Increasing road safety is one of the important priorities among the European Union's strategic actions. An important means of achieving the objectives set in this respect is the implementation of the project of the European-wide in-vehicle emergency notification system eCall. The article presents general characteristics of this system and its interaction with the emergency notification system based on the European emergency number 112. The author presented an analysis of use of the eCall system and reports received from it, which are directed to the emergency notification centres both in Poland and other European countries.

Keywords

eCall system, EU-wide emergency number 112, emergency notification system, eCall notifications

Introduction

It is an undeniable fact that the life of human beings and their everyday existence in general comes down to satisfying various needs. One of them is the need for safety, which is one of the most basic human psychological needs[1]. The state should unconditionally ensure security of its citizens. Regardless of the threats that occur, including threats to public and general security[2], the state structures should be prepared to deal with the consequences of the threats they face. It is a duty of the state[3] to create appropriate structures which will ensure the constant care and protection of citizens[4]. An important component of ensuring safety against threats[5] to the public and general security is the emergency notification system[6]. The emergency notification system is intended to enable rapid and direct access by everyone to rescue services[7], public order services and inspectorates. The aim is also to ensure an appropriate flow of information so that necessary and efficient help reaches those in need, in the shortest possible time. An important component of the emergency call system is a system made to automatically call for help from vehicles involved in accidents. Emergency Call (eCall) is part of the European road safety programme and at the same time an important element of the European Union's telecommunications policy. The functioning of this system requires that vehicles must be equipped with devices which automatically generate and send information about a road collision, send this information through the telecommunications network and ensure the processing of emergency calls and dispatching emergency services to the accident site.

eCall system and its functioning in Poland and in other countries of the European Union

It is estimated that this system will reduce the response time to emergency calls by 40-50% and the damages caused by road accidents by about 15%. These estimates justify the social and economic effectiveness of the eCall project[8]. On the telecommunications side, the eCall

[1] J. Ziobro, *Teoretyczne i praktyczne konteksty funkcjonowania Ochotniczych Straży Pożarnych w krajowym systemie ratowniczo-gaśniczym, Część I*, Difin, Warszawa 2019, p. 15.

[2] B. Wiśniewski, *Praktyczne aspekty badań bezpieczeństwa*, Difin, Warszawa 2020, p. 16.

[3] More: P. Lubiewski, *Bezpieczeństwo państwa w ujęciu systemowym*, „Zeszyty Naukowe SGSP", No. 74/2/2020, SGSP, Warszawa 2020, p. 115.

[4] More: B. Kaczmarczyk, B. Wiśniewski, R. Gwardyński, *Security of an individual*, Zeszyty Naukowe Państwowej Wyższej Szkoły Zawodowej im. Witelona w Legnicy, No. 3 (28) 2018, Legnica 2018, p. 67-78 and B. Wiśniewski, R. Gwardyński, *Współdziałanie i koordynacja działań drogą do poprawy efektywności działania Policji*, „Studia i Materiały Wydziału Zarządzania i Administracji Wyższej Szkoły Pedagogicznej im. Jana Kochanowskiego w Kielcach", t. 1 „Efektywność i bezpieczeństwo gospodarowania", No. 21, Kielce 2017, p. 220.

[5] B. Wiśniewski, *Praktyczne aspekty badań bezpieczeństwa*, Difin, Warszawa 2020, p. 16.

[6] More: B. Wiśniewski, G. Sander, *Zagrożenie, kryzys i sytuacja kryzysowa–jako uwarunkowania życia współczesnego człowieka*, „BITP", No. 41, Issue 1, Centrum Naukowo-Badawcze Ochrony Przeciwpożarowej, Państwowy Instytut Badawczy, Józefów 2016.

[7] B. Kogut, P. Lubiewski, *Organization of rescue activities in crisis situations caused by terrorist attacks*, Вісник Львівського державного університету безпеки Життєдіяльності, No. 2018/6/11, Issue 17, Lviv 2018, p. 18.

[8] S. Piątek, *Regulacyjne aspekty systemu powiadamiania o wypadkach drogowych – eCall*, Telekomunikacja i Techniki informacyjne 1-2/2009.

project is being developed as a complement to the existing 112 emergency call system with user location (E112). The implementation of this system has been an obligation of the EU Member States for years.

The origins of the eCall system are related to the introduction of the 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[9]. Importantly, the Directive in Article 3(d), assumes the standardisation of the eCall service within the European Union. An important legal act sanctioning the implementation of eCall is 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 eCall service[10]. In Article 1, the Decision imposes the obligation that Member States shall deploy on their territory the eCall infrastructure required for the proper receipt and handling of all eCalls, 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 eCall in-vehicle system[11]. The European Union countries, in the context of legal regulations, were obliged to establish an adequate infrastructure of eCall answering points in each case no later than 1 October 2017.

Functioning of eCall would not be possible without an emergency notification system and the EU-wide emergency number 112, established by Resolution of the Council of Europe of 29 July 1991[12] and made compulsory by Directive 2002/22/EC of the European Parliament of 7 March 2002[13], which was partially amended by Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009[14]. In accordance with those Directives, Member States shall ensure that all telephone users, including users of public payphones, can contact the emergency services free of charge using the EU-wide emergency number 112 and any national emergency call number defined by each Member State. Member States are also obliged

[9] Dyrektywa Parlamentu Europejskiego i Rady 2010/40/UEz dnia 7 lipca 2010 r. *w sprawie ram wdrażania inteligentnych systemów transportowych w obszarze transportu drogowego oraz interfejsów z innymi rodzajami transportu.* https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32010L0040&from=SL

[10] Decyzja Parlamentu Europejskiego i Rady No. 585/2014/UE z dnia 15 maja 2014 r. *w sprawie wdrożenia interoperacyjnej usługi eCall na terenie całej UE*. https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32014D0585&from=SK

[11] Rozporządzenie Parlamentu Europejskiego i Rady *w sprawie wymagań dotyczących homologacji typu na potrzeby wdrożenia systemu pokładowego eCall oraz zmieniające dyrektywę 2007/46/WE* /* COM/2013/0316 final – 2013/0165 (COD) https://eur-lex.europa.eu/legal-content/PL/TXT/HTML/?uri=CELEX:52013PC0316&from=pl

[12] Uchwała Rady Europy z dnia 29 lipca 1991 roku i usankcjonowana Dyrektywą 2002/22/WE Parlamentu Europejskiego z dnia 7 marca 2002 r. *w sprawie usługi powszechnej i związanych z sieciami i usługami łączności elektronicznej praw użytkowników.* https://eur-lex.europa.eu/legal content/EN/TXT/PDF/?uri=CELEX:31991D0396&from=EN

[13] Dyrektywa 2002/22/WE Parlamentu Europejskiego i Rady z dnia 7 marca 2002 r. *w sprawie usługi powszechnej i związanych z sieciami i usługami łączności elektronicznej praw użytkowników.* https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32002L0022&from=PL

[14] Dyrektywa Parlamentu Europejskiego i Rady 2009/136/WE z dnia 25 listopada 2009 r. zmieniająca dyrektywę 2002/22/WE https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32009L0136&from=EN

to ensure that calls to the EU-wide emergency number 112 are properly answered and handled in a manner best suited to the national organisation of emergency systems[15]. Ensuring the proper functioning of the 112 emergency number including eCall in all Member States of the European Union is a difficult task. However, an organisation has been set up that is working internationally to improve safety through the 112 emergency number. The European Emergency Number Association – EENA is a space established for cooperation and education for all the entities involved in creating widely understood safety[16].

Functioning of the emergency notification system in Poland is regulated by the Act of 22 November 2013 on the emergency notification system[17]. This system consists of emergency notification centres forming a unified network to handle emergency calls directed to the emergency numbers 112, 997, 998 and 999, enabling the transmission of an emergency call in order to engage the appropriate rescue resources. The eCall system goes into function during a road traffic collision or accident. The in-vehicle eCall device is automatically activated after the accident and, once activated, connects via the mobile phone network with the area-specific emergency notification centre in a form of an MSD message, enabling the transmission of the electronic data of the vehicle involved in the accident[18].

The eCall device also allows for manual activation of the system using a button in the vehicle cab by the accident victims themselves. People in another vehicle who witness an accident and have eCall in their vehicle can also inform the emergency notification centre about the incident by manually activating the eCall device[19]. In most cases, accident detection is automatic, based on sensor indications. If the limit overload on any of the vehicle axes is exceeded, the system automatically sends a notification to the central unit. Notifications about an incident from the eCall system are received by the emergency notification centre and the centre operator immediately connects with the vehicle and attempts to contact the driver or the passengers to determine the situation at the collision scene. In an emergency, the operator calls the rescue services[20] with a very precise indication (accuracy of up to 5 meters) of the location of the injured[21]. Emergency notification centres operate in a network that covers the whole territory of Poland and are located in every voivodship city and in Radom (17 in total).

[15] Ł. Szewczyk, *System Powiadamiania Ratunkowego. Gdzie jesteśmy i dokąd zmierzamy?,* Zeszyty Naukowe SGSP 2018, No. 1, p. 180.

[16] Lis K., *Numer alarmowy 112 – Zapewnienie bezpieczeństwa na poziomie europejskim*, Zeszyty Naukowe PWSZ 2020, No. 34(1), p. 103

[17] Ustawa z dnia 22 listopada 2013 r. *o systemie powiadamiania ratunkowego,* Dz. U. 2013 poz. 1635 z późn. zm.

[18] Ł. Szewczyk, *System Powiadamiania Ratunkowego. Gdzie jesteśmy i dokąd zmierzamy?,* Zeszyty Naukowe SGSP 2018, No. 1, p. 181.

[19] Lis K., *Determinanty zarządzania informacją w centrum powiadamiania ratunkowego*, Zeszyty Naukowe PWSZ 2018, No. 28(3), p. 93.

[20] More: Stawnicka J., Wiśniewski B., Socha R. (ed.), *Zarządzanie kryzysowe. Teoria, praktyka, konteksty, badania*, WSPol, Szczytno 2011.

[21] B. Kogut, *Doskonalenie współpracy Państwowej Straży Pożarnej z centrami powiadamiania ratunkowego*, [in:] *Racjonalizacja zarządzania jednolitymi formacjami umundurowanymi odpowiedzialnymi za bezpieczeństwo wewnętrzne,* SGSP, tom VI, Warszawa 2020, p. 113.

According to the assumptions adopted in the Ministry of Digital Affairs, the obligation imposed by the decision of the European Parliament to introduce the infrastructure of points for receiving notifications about eCall accidents on the territory of the European Union was implemented on the Polish territory by 1 October 2017[22].

Emergency notification centres handle eCalls in accordance with the requirements of the national legislation on the handling of emergency calls. They have access to a proper geographic information system or an equivalent system that enables the operator to receive 'eCalls' and to determine the position and course of the vehicle to the minimum accuracy specified in EN 15722:2020[23]. Emergency notification centres allow the relevant emergency services or partners to receive minimum set of data, which includes:

- the number from which the eCall was generated,
- the type of call (manual or automatic),
- the GPS coordinates of the vehicle,
- the direction the vehicle was headed,
- the time of the incident,
- technical vehicle data (type of vehicle, type of fuel),
- number of passengers wearing seat belts,
- VIN number.[24]

The minimum data package is only transmitted to the emergency notification centre when the eCall module is activated (manually or automatically). It is not possible to download data when the eCall module has not been activated.

If necessary, a centre may redirect the notification and data package to another centre according to the national procedures established by the national authority[25]. The rerouting can be done by the means of a data call or an audio call, or preferably both[26].

The aim of the study was to present the implementation of the eCall system in Poland and its functioning in comparison with other European Union countries. The adopted aim influenced the formulation of the research problem with the following wording: How does the number of calls through eCall system evolve in Poland and other European Union countries? The research problem expressed in this way allowed examining those areas of knowledge necessary to present the possibility of increasing the number of calls through the eCall system for the benefit of improving safety and the functioning of the 112 emergency notification system.

The assumed aim and the adopted research problem determined a selection of theoretical and empirical research methods. Analysis of statistical data played a key role in the research process. The adopted research methodology assumed

[22] *Raport z funkcjonowania systemu powiadamiania ratunkowego w 2017r.*, Ministerstwo Spraw Wewnętrznych i Administracji, Warszawa 2018, p. 47.

[23] T. Kamiński., I. Mitraszewska, G. Nowacki., M. Walendziak., M. Niezgoda, R. Grzeszczyk R., *System automatycznego powiadamiania o wypadkach drogowych eCall*. Logistyka No. 6, 2009, p. 48.

[24] www.gov.pl/web/numer-alarmowy-112/ecall-ogolnoeuropejski-system-szybkiego-powiadamiania

[25] B. Wiśniewski, *National Security—Essence, System, Research*, „Internal Security", No. 2/202o, Police Academy, Szczytno 2020, p. 37.

[26] G. Nowacki, M. Walendzik, C. Krysiuk, *Funkcjonowanie centrów powiadamiania ratunkowego (CPR) w ogólnoeuropejskim systemie eCall*, Logistyka, No. 4, 2014, p. 29.

comparison of statistical data in the category of the number of calls for help through the eCall system in individual European Union countries. The analysis included data for the period spanning the years 2018-2020 of the functioning of the eCall system in Poland and for the years 2018-2019 in the European Union (as of today, no data of the operation of the eCall system in 2020 in the European Union have been published).

Emergency notification centres in Poland started processing eCalls from across the country in 2018. Overall, in the first year of eCall's functioning, there were a total of only 264 reports received through the system. The following year saw a major increase with 1, 673 calls received through the eCall system. In 2020, 5418 calls were received through said system[27]. Therefore, we see a rapid increase in the use of the system for reporting incidents that require rescue services.

Let us now further analyse data on the topic we are investigating. The relevant eCall legislation became effective during the reporting period. Member States had to ensure that their PSAP (Public Safery Anserwing Point) system was ready to receive electronic calls from 1 October 2017. As of 31 March 2018, car manufacturers should install a 112-based eCall in-vehicle system in all new types of M1 (passenger cars) and N1 (light delivery vans). As the relevant regulation only applies to new vehicle types that must undergo the approval process – and therefore not to all newly built vehicles – its effects only started to be noticed starting 2019. Data reported by 22 Member States indicate that the eCall system has been implemented, however, in some cases the data sent do not separate test calls from real emergency situations[28].

After analysing the data for 2017-2018, we notice that we can distinguish a group of countries where the percentage of calls via eCall is significant, these are Slovenia, Denmark, Spain and Finland. This percentage of calls in the following years will probably show an increasing trend. The countries where the percentage of eCall receipt is negligible include Bulgaria, France, Lithuania, Romania and Croatia.

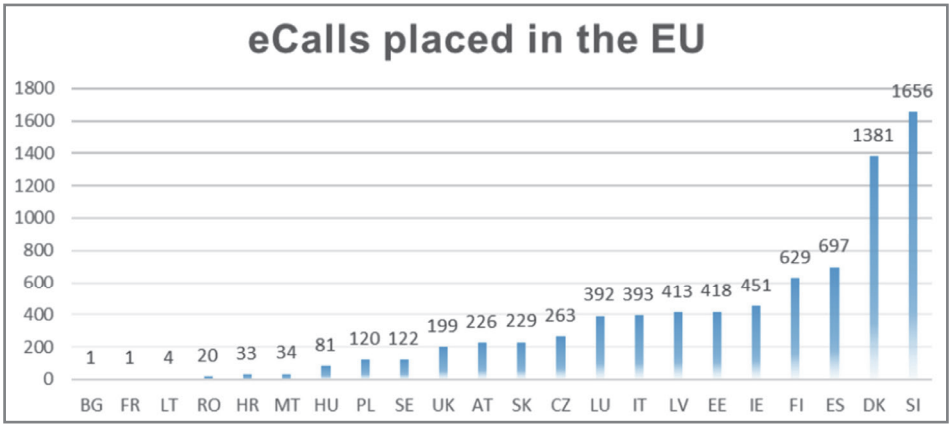
The next report shows us the number of reports received through the eCall system in the year 2019. Data reported by 26 Member States and Norway indicate that the eCall system has been implemented. However, as before, the reported data does not separate test calls from real emergencies in some cases[29].

After analysing the data for 2019, we notice that we can distinguish a group of countries where the percentage of calls via eCall is high, these are Italy, France, Spain and Bulgaria. The countries where the percentage of calls received by eCall is negligible include Lithuania, Malta, Estonia and Hungary.

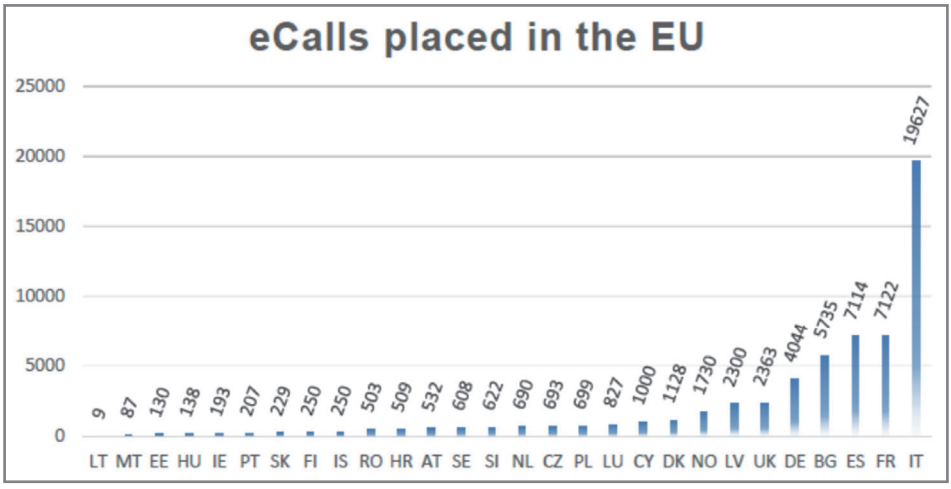
[27] *Raporty z funkcjonowania systemu powiadamiania ratunkowego w 2018, 2019, 2020 r.*, Ministerstwo Spraw Wewnętrznych i Administracji, Warszawa.

[28] COMMUNICATIONS COMMITTEE Working Document Subject: *Implementation of the single European emergency number 112 – Results of the twelfth data-gathering round*, https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=57476

[29] COMMUNICATIONS COMMITTEE Working Document Subject: *Implementation of the single European emergency number 112 – Results of the thirteenth data-gathering round*, https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=64510



Source: COMMUNICATIONS COMMITTEE Working Document Subject: Implementation of the single European emergency number 112 – Results of the twelfth data-gathering round (Communications committee, 2019).



Source: COMMUNICATIONS COMMITTEE Working Document Subject: Implementation of the single European emergency number 112 – Results of the thirteenth data-gathering round (Communications committee, 2020).

European experts have estimated that the eCall system, when fully deployed across the European Union, should reduce accident fatalities by at least two and a half thousand per year. The time spent waiting for the emergency services is estimated to be cut by 40% in urban areas and 50% in rural areas thanks to eCall. The introduction of eCall is expected to have a significant impact on reducing the traffic overloads caused by road accidents and thus on reducing the overall traffic load on European roads[30].

[30] G. Nowacki, M. Walendzik, C. Krysiuk, *Funkcjonowanie centrów powiadamiania ratunkowego (CPR) w ogólnoeuropejskim systemie eCall*, Logistyka, No. 4, 2014, p. 32.

Poland has a very high accident rate per 100 thousand inhabitants. Approximately three and a half thousand people die on Polish roads each year. The annual costs of fatal accidents in Poland amount to over 6.5 billion PLN. According to the estimates presented above, full implementation of the eCall system could save up to 350 lives per year and thus, reduce the costs of accidents by nearly 650 million PLN[31].

Implementation of the single EU-wide emergency number 112, including the eCall system, was a response to a changing world and the incentive to increase the level of safety for European Union citizens. It also made it possible, in many countries including Poland, to significantly change and improve the previously functioning emergency notifications. The eCall system is a comprehensive solution which assists in making an emergency call in the event of an accident in Europe and shows its potential when it comes to saving lives and limiting the effects of car accidents in general.

Conclusions

The development and ensuring its functionality have been complicated and have been ongoing for more than a decade. Nevertheless, eCall is also expected to develop further and offer even more modern functionalities in the future. Far-reaching technical progress, ongoing research and the introduction of new solutions will provide better and innovative tools to improve the functioning of the system, but the most important will undoubtedly still be the human being. Their awareness, knowledge, experience and willingness to help others.

[31] K. Goniewicz., M. Goniewicz, P. Misztal-Okońska, P. Witold, R. Czerski, *The European emergency number 112 – the questionnaire*. Journal of Education, Health and Sport, 2017, p. 36.

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