

EFFECT ANALYSIS ON THE IMPLEMENTATION OF AUTOMATIC EMERGENCY CALL SYSTEM eCALL

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Abstract

Article describes projects currently carried out in Europe, which were aimed at evaluating the implementation effects of Pan-European eCall system that is based on GSM technology. For this purpose there were performed pilot implementations and socioeconomic evaluation of system components in terms of profits and costs. Research projects, which were carried out in: Germany, France, Finland, Sweden, Netherlands, Austria, Czech Republic and Hungary demonstrated the possibility of reducing the number of casualties and severe injuries as a results of traffic accidents by shortening the time needed by emergency services on the road for rescue actions. Paper presents a summary describing European research projects results and it underlines most important benefits of eCall implementation and important.

It also includes important eCall facts and events. Article shows that development of new rescue solutions has an impact on decreasing negative effect of road collisions. In summary article describes major requirements that are needed to introduce eCall system in all EU membership countries, requirements include emergency number network, devices in vehicles and architecture.

Keywords: *eCall, eSafety, traffic safety, emergency response, emergency management*

1. Introduction

The system of automatic calling of assistance from the vehicles participating in accidents - Emergency Call (eCall) is a part of European program in range of road safety and important element of telecommunication policy of European Union. It's developed as a supplement of already existing system of alarm connections with number 112, and is expanded with the localization of the user – service E112. The main task of eCall system is to inform about the traffic accidents by using the infrastructure of GSM network, with the same technical standard and quality of services, independently of which of the European Union countries and accident would take place.

The basic reason of introducing eCall system was lack of technical solutions in countries of European Union which allow taking emergency call about accidents. A lot of accidents has place beyond over built area, in places that are far away from rescue service sentries. Besides, unawareness about the exact place of accident extends time of reporting about an accident, what can lead to the permanent invalidity or death of the participants of the traffic accident. Detailed

information about accident (in example: number of vehicles taking part in the accident) makes possible to send the adequate number of rescue service vehicles to the place of accident. The information about the type of the vehicle is very important, because they give the possibility to send the specialist units with proper equipment.

Implementation of the system is simultaneously reducing the costs. Equal the direct (economical) and indirect costs connected with the suffer and the lost of the quality of live for the casualties after accident. Smaller number of accidents is equivalent of smaller stress and suffering of the participants. Therefore it is proper to underline the additional effect in the form of preventive maintenance of trauma, which can appear after the accident. The costs of people's tragedies are hard to value and usually uncountable.

Implementation of this system in Europe was planned for year 2009. Then, it was postponed to year 2010. Currently, it is assumed that implementation will take place in 2014. All cars sold in Europe will be equipped with on board eCall device. But realization of this purpose depends from governments of each country, who must improve their systems of reacting in emergency, modernize the rescue services and PSAP infrastructure, to fit it to serve eCall applications and data included in minimum set of data. Despite that, these initiatives involve costs (that's why not all of the countries have been included to the project) is an important initiative in favour of saving human's life.

The eCall project doesn't have bases in legal acts of European Union yet. It is define in non-legislative acts, especially in messages of European Commissions and information documents. Indirectly, the basic acts of eCall project is created by acts of law concerning the emergency connection to number 112 and these kind of connections enriched with location data (E112). Achieving the duty of state members, resulting from these acts is preliminary condition of realization the eCall project.

2. Pilot implementation of eCall project

To estimate the results of eCall system implementation, in many countries of European Union were carried the trial implementations of individual elements of eCall system or evaluation of devices operations which were similar to these, which will be used in the system. Below are described the chosen pilot implementations.

The purpose of E-MERGE project was conducting the research "proof-of-concept", to show the possibilities of eCall system in pan-European context. Within the confines of project the most significant potential influence of eCall for the road traffic was valued in foothold of so called "principle of golden hour" and the questionnaire directed for specialists working in Public Centers of Rescue Service (PSAP). The questionnaire was sent for all of partners taking part in Project (Italy, Spain, Germany, Holland, Sweden and Great Britain). Within confines of this project were used the results of German project STORM. Its purpose was, inter alia, estimation of influence of the eCall system on time related with arrival of rescue service into the place of the accident. The results of E-MERGE project were taken into account in many other researches.

Another pilot project was „Automaattisen hätäviestijärjestelmän vaikutukset onnettomuustilanteessa (Impacts of an automatic emergency call system on accident consequences)", which purpose was to estimate the influence of eCall system on effects of traffic accidents. In project was estimated: the number of fatal accidents, which could be avoided within one year, reduction of time of rescue services reaction, and meaning of localization information and kind of vehicle failure.

In project called „Socio-economic Impact Assessment of Stand-alone and Co-operative Intelligent Vehicle Safety Systems (IVSS) in Europe, Cost-Benefit Analyses for standalone and co-operative Intelligent Vehicle Safety Systems" was prepared the estimation of social and economic effects of intelligent safety systems in vehicles (IVSS) and the influence on road traffic safety and efficiency. Project includes the analysis of costs and benefits.

Project called "Exploratory Study on the potential socio-economic impact of the introduction

of Intelligent Safety Systems in Road Vehicles” had on its purpose to estimate the social and economics benefits resulting from implementation of new devices in vehicles (IVSS).

The part of European project TRACE “The effectiveness of Advanced Automatic Crash Notification systems in reducing road crash fatalities” was evaluation of influence the OnStar system (local system of automatic reporting about crash-accidents) on number of casualties of road accidents in Australia.

The project “eCall – The Case for Deployment in the UK. Final report” was accomplished in Great Britain. The social and economic costs of implementation the eCall system were valued in research in which were valued difficulties related with accustoming and influence of other initiative connected with additional devices in vehicle. The influence of eCall system on number of casualties and hard injuries were estimated in base of the influence of time reduction of reporting and arrival on place the rescue service team to the scene of accident.

The purpose of project „Erie county automatic collision notification field test” was to show of the benefits of property the automatic system of reporting about crash in the vehicle (ACN) and its results for the injured in case of failure of the vehicle. Potential damages and decrease of fatality were valued by determination the time between the accident and reaction of the medical service and on base of the researches in medical publications.

The pilot research of eCall system “eCall Pilot 2006 in Österreich” were organized in Austria and were focused on, inter alia, research of the voice connections and SMS as medium of alarm information. In this research was not analyzed the influence of eCall for the road traffic safety.

The research “Ex-ante evaluation of an emergency call system (e-Call)” about social and economical that bears implementation of eCall system was made in Czech Republic too. The influence of eCall on number of fatalities was counted in base of classification the injured in road accidents, reduction of time between collision, notification and time of reaction of the emergency services.

In the project “Ekonomisk värdering av eCall and Sverige (Socio-economic benefits of eCall in Sweden)” was valued the socio-economical costs of accustoming eCall system in Sweden. The analysis was made on base of the results of earlier researches like E-MERGE, SeiSS and STORM, the “principle of golden hour” and Swedish accident statistics.

In project “E-call en Verkeersveiligheidskans, DEEL 4: De verwachte directe en indirecte effecten van e-call in Nederland” was valued the influence of eCall on decrease of fatalities. In all fatal accidents on roads (with participation of vehicles equipped potentially with eCall device) were taken under note these, where death was not immediate but followed soon (in place of accident or in hospital). Estimation was focused also on number of accidents in which the eCall system will result with faster information of emergency services about the accident.

3. Executed projects related with eCall system

The basis of eCall performance will be the system of emergency number 112. The duty of implementation the rescue system (emergency number 112) impose to the EU countries the directive no 2002/22/WE of European Parliament and Council from 7 march 2002 regarding general services and related with network and electronic services users laws. According to Directive, the State Members should provide:

- in attachment to other national alarm numbers defined by national regulating organs, all of final users – public available phone services, the possibility of free contact with emergency services by utilization the homogeneous European alarm number 112 (article 26 act 1),
- proper reception and service of calls of the homogeneous European number 112 to manner best respondent to the national organization of alarm systems and containing in borders of the capabilities of the network (article 26 act 2),
- to provide, by enterprises leading the telecommunication public network, to the emergency information institution data about the location of calling person, in technically possible degree for calling the homogeneous alarm number 112 (article 26 act 3).

Tab. 1. The influence of eCall system on road safety

Project	Results
E-MERGE	<ul style="list-style-type: none"> - Decrease number of fatalities in traffic accidents by 5-10% (2000-4000 persons every year in EU countries in 2002), - Reduction of approaching time of the emergency services from 21,2 to 11,7 minutes in country areas and from 13 to 8 minutes in the city,
AINO Study	<ul style="list-style-type: none"> - Decrease number of fatalities in traffic accidents in Finland by 4-8%,
eIMPACT	<ul style="list-style-type: none"> - Decrease number of fatalities in traffic accidents in UE-25 countries by 5,8%, if 100% of the car fleet would be equipped with eCall system, - eCall was the reason of very small increase (0,1%) of injured persons number in traffic accidents because the fatalities were treated in calculations like injured,
SEiSS	<ul style="list-style-type: none"> - 2,492 – 7,477 fatalities (every year) will change into hardly injured in EU-25 countries in 2002, - 30,013 – 45,019 hard injuries (every year) will change into slightly injured in EU-25 countries in 2002. It means, that the number of hardly injured will decrease by about 27,521-37,542 injuries every year (in case of 100% implementation of eCall system in passenger cars in Europe), - In referee to E-Merge project– number of fatalities in accidents will decrease by 5-15% and about 10-15% of hard injuries will be converted into slight injuries,
TRACE	<ul style="list-style-type: none"> - OnStar will influence by decreasing the number of fatalities in road accidents by 10,5% in the cities and 12% in country area, - It is forecasted that yearly 40,7 % of fatalities in the cities, and 63% in country areas will be saved by OnStar in Australia, - Savings of about 2,3% of total costs related with taking part in traffic accidents (passenger car) in Australia, - Decrease of the notification about accident time to one minute, from an average of 4 minutes in city area and 7 minutes in country area
SBD	<p>Assuming that two third of all vehicles on the roads in 2020 will be equipped with eCall device:</p> <ul style="list-style-type: none"> - There will be 3% reduction of all casualties of road accidents in Great Britain (about 70 fatalities a year) in 2020, - It's possible to decrease by 2% the number of all hard injuries in car accidents in Great Britain in 2020 (490 persons a year), - The eCall system can improve the reacting time of emergency services even about 10 minutes, end every reduced minute of reaction can contribute with large number of saved people,
Erie county automatic collision notification field test	<ul style="list-style-type: none"> - Largest profits from ACN in the country area, - Influence of ACN to decrease the number of fatalities of road accidents by 20%,
Austrian eCall study	Lack of analysis in report,
Czech eCall study	<ul style="list-style-type: none"> - Reduction of fatalities by 3-9% on motorways and another ways in Czech Republic, - Estimated reduction of hard injuries by 5-10%, - Time from the moment of accident till the connection will reduce to less then 1 minute, - It was assumed that the system will save about 3-5 minutes,
Swedish eCall study	<ul style="list-style-type: none"> - Decrease number of fatalities in car accidents by 10-20 every year in Sweden, what is 2-4% of all fatalities, - Decrease the number of hard injuries in accidents by 3-4% in Sweden, - Decrease the time between the accident and arrival of emergency services from 20 to 10 minutes in the city area and from 9 to 5 minutes in the country area,
Dutch eCall study	<ul style="list-style-type: none"> - Expected decrease of fatalities in road accidents by 1-2%, - Severity of injuries will be decreased to 1% among wounded transported to the hospitals.

Source: Personal elaboration on base: "Impact assessment on the introduction of the eCall service in all new type-approved vehicles in Europe, including liability/ legal issues" FINAL REPORT. November 2009

The first step to implement the eCall system was taking activity in range of creating the Informatics System of Emergency Reporting (SI PR). There was developed a project, which purpose is to build the nation-wide teleinformatic platform, providing a support of public order and rescue services in range of attendance the number 112 and another alarm numbers by implementation the national teleinformatic platform for functioning the Centers of Emergency Reporting (CPR) and the Provincial Centers of Emergency Reporting (WCPR).

Project acts under name Informatics System of Emergency Reporting (SI PR) consists two operations:

1. To prepare and equip Centers of Emergency Reporting (CPR) – realization within the confines of 7th pivot of Innovative Economy Operative Program.
2. To prepare and equip Provincial Centers of Emergency Reporting (WCPR) – realization within the confines of 12th pivot of Infrastructure and Environment Operative Program.

Next, presently performed project concerns the Localize-Information Platform with Central Database (PLI CBD) in the 112 emergency system. PLI CBD (realized by MSWA) is a part of Nation-wide Informatics System of emergency reporting and is responsible for transferring the data about localization of public phone network terminals (stationary and movable), which has performed the emergency call. PLI CBD will support the CPR activity. Performance of the venture relies on developing and starting the PLI CBD is fulfilling the obligation imposed by Chairman of Electronic Communication Office. First preparatory activities for preparing this task started in 2007, and duration of the project is scheduled for years 2009-2011.

Other project during preparation is Polish Nation-wide Teleinformatics Network for attending the emergency number 112. Within confines of realization, in this project will be built modern teleinformatics network providing the transmission of data for special services in range of attendance the transmission of data for security and rescue services, for improvement of cooperation between units of special services in attendance of emergency call 112 and another alarm numbers. Project includes, inter alia, devices and software for connection into 868 network the localizations important for functioning of Provincial and Local Centers of Emergency Reporting (WCPR and CPR), State Fire Service, Police and Medical Rescue ensuring all necessary teletransfer and voice connection services.

4. Summary

Presently in Europe hasn't appeared the directive ordering implementation of the eCall system in state members. Therefore, actually are performed preparatory activities efforts to implement the system. Their basis is agreements in range of functionality of the system and defining and approving the standards, under which system will work. In individual countries were performed estimations of results and pilot implementations of system. In Poland lasts the estimation of results of implementation.

Implementation of all the functions of eCall system requires fitting of national infrastructure and law, for obtainment the full functionality and interoperation with other systems functioning in European Union states. To initiate the system is required full functionality of service 112 and E112. The regional Centers of Emergency Reporting should be equipped with software enabling reporting's obtainment. System operators should be prepared for reception of emergency reporting's in many languages, according to earlier developed procedures.

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