BUSINESS MODELS FOR EXTENDING OF 112 EMERGENCY CALL CENTER CAPABILITIES WITH E-CALL FUNCTION INSERTION

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The present article concerns present status of implementation in Romania and Europe of eCall service and the proposed business models regarding eCall function implementation in Romania. eCall system is used for reliable transmission in case of crush between In Vehicle System and Public Service Answering Point, via the voice channel of cellular and Public Switched Telephone Network (PSTN). eCall service could be initiated automatically or manual the driver. All data presented in this article are part of researches made by authors in the Sectorial Contract Implementation study regarding eCall system, having as partners ITS Romania and Electronic Solution, with the Romanian Ministry of Communication and Information Technology as beneficiary.

Road safety, information technology, communication, ecall, emergency call center.

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1 Introduction

1.1 Road fatalities

Since 2004, European Commission has developed an integrated plan named e-Safety, as primary pillar on Intelligent Car Solution i2010 initiative. It objective is connected with vehicle safety, keeping in mind the excessive number of road accidents. This plan fallows all phases regarding vehicle safety as *exposure, crash avoidance, injury reduction* and *post-crash* situations.

The issue of road safety, including all phases: information, support, intervention, crush and post-crush, is very severe, because of its repercussions in population health and death causes. First, we must see any effort of saving lives or limiting and preventing injuries from humanitarian reasons, where a live lost is not measured in financial terms for the family members. The second point of view, an accident has as result time of work incapacity, expenditures with treating injuries and so one. From World Health Organization published statics' we emphasize that road accidents are in 2004 estimated as 2,2 percent of death causes, being the ninth as percent and for 2030 to 3,6 percent of total deaths, rising on fifth place as cause of death, being estimated on 2,4 million fatalities around the world ([1]). In the same report is clearly reveled the connection between funds invested in prevention policies and number of accident, the cost of road traffic injury being estimated at 518 billion USD world-wide, for countries with poor economic settings, losses being bigger then fund invested in development of prevention measures. In Europe road traffic injury fatality rates (per 100 000 population) is 12,9 with 19,3 rate for middle-income countries (e.g. Romania), being lower for high-income states (7,9) and even for low-income countries (12,2).

For Romania, reported road traffic fatalities (2007) is 2712 (86 percent males, 14 percent females) and non-fatal road traffic injuries (2007) 29832, with total registered vehicles 4,6 million (2008). In 2008, from Romanian Police data are registered 10472 severe road accidents with 2999 fatalities, 9260

persons with severe injuries and other 3125 persons injured (non-severe), with 23,7 percent increase for number of severe road accidents compared with the year 2007. The same report also emphasize the increasing of road accident without injuries with 16,3 percent comparing with 2007 (full data [2]). As primary conclusion, for Romania, with 6150USD/habitant income (in 2007), estimated as being middle comparatively with other countries, with 81693 km (2008) of national roads the road safety became a serious issue.

1.2 Implementing IT technologies in safety measures

Starting from this situation where both humanitarian and economic reasons are important, on 2004 a number of discussions were held between the Commission for the European Communities (CEC), the automotive industry, the telecommunication industry and European Telecommunications Standards Institute (ETSI) regarding the development of various safety systems, covering all phases mentioned above on European level, called e-Safety [3]. This initiative has promote the concept of Intelligent Transport Systems (ITS) [4], where new and advanced information and communication technologies (ICTs) is incorporated on-board in order to help preventing or avoiding traffic accidents, limiting the accidents consequences, provide real-time information for drivers about local traffic, optimizing the cruise by avoiding road congestion roads, assistance in post-crush situations [5]. To a better understanding, we emphasize the phase of intervention and related technologies. First phase is *Information* with related technologies: *Dynamic traffic management*, *Extended environmental information*, *Real time traffic information* and *SpeedAlert*. Second phase, *Support,* with *Adaptive Head Lights, Blind spot monitoring, Extended environmental information, Lane departure warning, Local danger warning* and *Obstacle and collision avoidance*, followed by *Intervention* phase with *Electronic stability control, Lane keeping assistant* and *Longitudinal support and collision warning*, *Crush* with *Obstacle and collision warning* and *Post-crush* with *e-Call* technology. Most of these technologies are implemented by i2010 Intelligent Car initiative. As part of this initiative, eCall is defined as a specific item in the scope of the e-Safety initiative. eCall is seen as an extensio of current E112 capabilities, enabling the automatically transfer of eCall data between the Vehicle and the Public Safety Answering Points (PSAPs) in case of crush, supposing that the passengers are wounded or unaware to make the call to 112. This should rely on existing E 112 network architecture.

2. 112 and eCall Function Insertion Status

Part of e-Safety plan is to extend 112 Emergency Call Center capabilities with eCall function insertion, to enable the transferring of eCall data between the vehicle and the Public Safety Answering Points (PSAPs), relying on existing 112 network architecture.

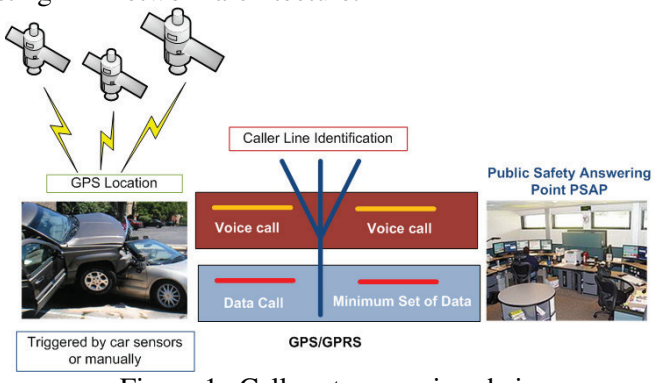

Figure 1 eCall system service chain

As it shown in Figure 1, eCall system use existing E112 networks to communicate between a vehicle and a public emergency service center, providing reliable full-duplex data communications between IVS and PSAP in addition to emergency voice call (E112) via the cellular network, and can be initiated either automatically or manually. If an accident occurs, the device will call the emergency services and

will communicate the exact location of the vehicle. Thus, emergency response time will be reducing, and the wounded will be treated more quickly and more lives will be saved. Advanced communication and information technologies have great potential to improve safety on roads.
The eCall objective is to reduce the number of roadway fatalities by minimizing the response time when an accident has occurred, being estimated by EC on 2500 person each year as fatalities because of non-intervention or long intervention time.
Location-enhanced emergency calls like in-vehicle e-Call have their primary benefit to society of saving lives and in offering an increased sense of security. eCall is a combination of an In Vehicle System (IVS), a device with a GSM cell phone and GPS location capability, and a corresponding infrastructure of PSAPs [6].
Under the Action Plan, automobile manufacturers and technology companies to be as up in late 2005 to agree on standards and technical specifications necessary to complete the tests, because in 2010 a part of new vehicles are equipped with this technology, as European Commission has announced, major implementation phase being expected to 2020. Main advantage of eCall implementation is that 112 intervention procedures are set in all European countries, with few exceptions.
In Romania, the 112 has one PSAP to each county, organized under Special Telecommunication Service, who is developing the modules needed to introduce the new service. What is missing is the Memorandum of Understanding between national MNOs and STS and as a result one of next possibilities of implementation:
- Mandatory for new cars, that having a result a critical mass of vehicle in 2020;
- Mandatory for cars insurance (CASCO or RCA), where the insurance company will install eCall IVS to prevent thefts to finance damages from unreal accidents, critical mass of vehicle being expected immediately (with limitation of car age caused by lack of sensors);
- Optional for car insurance, with discount insurance (20 percent in France), with the same idea of preventing thefts.

3. Business models for eCall function insertion

To establish the possible business model we have to define the cost and incomes for the eCall service. Basic, are two models for implementing eCall service. First, one is based on private PSAP, the Minimum Set of Data [7] being received by a PSAP [8], managed by insurance companies or car manufacturers. After receiving data about the crush, the PSAP operator decides if a live is putted in danger situation. In this case, the operator, accordingly with the Law No. 160/2008 regarding the implementation of the Single National Emergency Call System (SNECS), transfers the call to Special Telecommunications Service, who is the unique administrator. STS, announce, depending on the crush details and severity, the competent authorities such Ambulance, Police or Emergency Situation Inspectorate (Fire/Rescue). Accordingly with the procedure, those authorities must close the emergency case (after it is solved) and report to PSAP. The closing data are reported from STS to private PSAP, who initiate the procedure. The private PSAP could make capital out of selling diverse reports to third parties (insurance companies, transportation companies etc.). The information flow is presented in figure 2. The second is based entirely on existing SNECS managed by STS. In this case, SNECS receive MSD [9] resulted from car accident, announce the competent authorities, close the emergency case and could sell various reports to third parties. The question is what solution could provide an efficient business models. It is expected that all the cost involved by implementation, operation and maintaining.

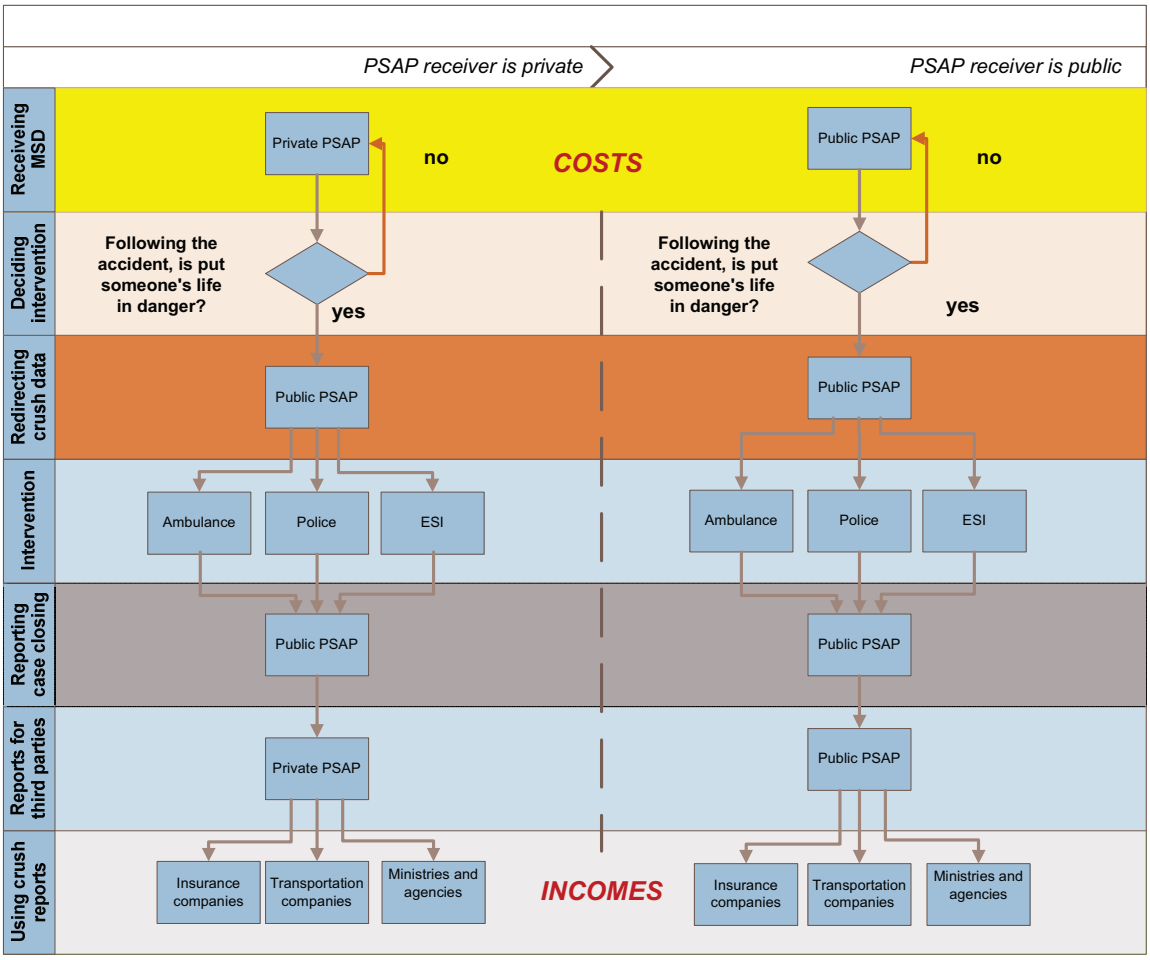

Figure 2 Comparatively information flow for eCall bsiness models

If private PSAP is put on target, the cost of implementation are very high because, none of Romanian companies from assurance or transportation field, accordingly with our study, based on questionnaire in December 2009- February 2010 [10], is not interested in develop their own PSAP. So, if any private company intent to develop such PSAP it is need to:

- Connect to all PSTN, to receive a digital compressed data under the form of MSD,
- Extract from MSD the VIN code and connect to Romanian Automobile Registry database to establish vehicle manufacturer, type, color,
- Decide, after a voice call or other procedural step if is an emergency life situation. Must have its own call center,
- Collect closing data from STS and prepare reports for third parties.

In public PSAP case, all those operations are currently covered in classic 112 emergency life situations. What must be developed is:

- Prepare the system for MSD receiving, supposing additional software module developing to existent system,
- Complete hardware infrastructure with servers for switching and recording data and additional voice calls,
- Testing entire chain service and also the crossing border situations,
- Develop special procedure for eCall.

Now, Romania is part of FP7 initiative named eCall National Projects, European Commission providing 50% of implementation and testing costs. The project will start in January 2011, having a

three years durations and one million euro total budget for Romania. The project consortium bring toghether ITS - Romania, STS, RNADCR, UTI, Romanian-American University and El- Sol. The first conclusion is that because of lack of interest of assurance and transportation companies, first implementation will be with a single public PSAP managed by STS.
The second issue is the In Vehicle System, supposing that every car to be equipped with a device capable to transmit the MSD with GPS position and VIN code and support a voice call. In this case, based also on the same questionnaire, the assurance companies are not interested to support entirely or a part of implementation cost, evaluated between 50 and 150 euro/car. Therefore, the implementation situation could be as fallow:
- For old vehicles by owner request, if the vehicle already has the sensors for triggering the call in crush situations,
- Mandatoiy for new car produced in Romania from 2013,
- Mandatory for new cars registered in Romania from 2020.
In the plan presented, we expect to reach 30% of registered vehicle until 2018, and 45% in 2020, based on actual and presumed vehicle replenishment rate in period 2010-2020 and predicted number of vehicles. The operation and maintenance for 112e service will be sustained financial by government budget with co-financing from selling reports for third parties. Car owner will pay IVS on vehicle purchasing time.

4. Conclusions and Future Works

In order to make the reporting of an accident more simple and to give the emergency call operator more information about the accident the European Commission launched a communication telling the EU Member States to implement the single European emergency call number 112, which has been follow by all EU Member States. In addition the European Communication launched a recommendation about the enhanced El 12 number, with also provides the location when an emergency call initiated from a cellular phone. From the network operators and service provider's perspective they are developing different systems for all vehicles manufactures, which is making the system expensive and not able to work across the different EU Member States. Another conclusion is that if there should be a Pan-European eCall system, the vehicle manufactures or the network providers cannot develop these themselves. It is very important to include the public eCall MSD signaling system should be based on a in-band modem/signaling application eCall In-band Modem.
The present article presents the research made in Sectorial Contract Implementation study regarding eCall system, Romanian Ministry of Communication and Information Technology. The eCall system utilizes existing El 12 networks to communicate between a vehicle and a public emergency service center. The authors are direct implicated though its partner ITS Romania, which have signed the European Commission MoU regarding eCall. Therefore, what we claim in this article is the general plan of implementation for Romanian of eCall technology, as the result of Sectorial Contract *Implementation study regarding eCall system,* being now on third phase, project-having deadline in September 2010. To conclude, we propose an architecture with a single PSAP managed by STS and calendar to impose IVS on new car. In 2020 we expect a 45% coverage of the service. Next, for future work, we will participate to eCall implementation, as a part of FP7 already constituted consortium.

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