FINDINGS REGARDING ECALL AFTER-MARKET COST BENEFIT ANALYSIS

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Abstract

Increasing the safety of road traffic participants is a key issue for experts in this field. One of the devices that can be installed on board vehicles, with a positive impact on the decrease of the intervention time in case of road accidents is the eCall based on 112. The present study takes into the preliminary results of the Technology Acceptance Model (TAM) application to evaluate the intention of the potential consumers to purchase and use the eCall on the vehicles, and of an Economic Cost Benefit Analysis (CBA) which evaluate to what extent it is advisable to install an eCall after-market device on passenger vehicles driven on European roads. The paper demonstrates that a TAM-based model assessing drivers' intention to purchase/use an eCall system has good predictive and explanatory capacity. The CBA shows that in a do something scenario the benefit/cost ratio is strongly influenced by the price level.

Keywords: eCall based on 112, Technology Acceptance Model, Cost Benefit Analysis, European Standardisation

JEL Classification: D61; O12; O18

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1. Introduction

In a general approach, the rhythm of economic and social progress has always been decisively influenced by the volume and quality of investments. Moreover, in any economy there are several key areas, which have a major impact on both the general welfare and the quality of life. From our point of view, one of these fields is transport, and we need to continuously improve its safety. With the aim of defining the standards and specifications and pave the way for deployment of aftermarket eCall in-vehicle systems (eCall IVS), the sAFE project seeks to identify requirements for aftermarket 112-eCall systems and devices, set the required options of aftermarket eCall systems meant to use the single 112 emergency number, and assist the European Standardisation bodies in developing the necessary technical standards for aftermarket eCall IVS.

The need justification for reaching Cost Benefit Analysis (CBA) for after-market eCall based on 112 is based on the following arguments (Schulz and Scheler, 2018, p. 2): the eCall system is a technology designed to help increase road safety, which holds a central position in the EU Road Worthiness Package 2020 (published in May 2017, which also includes specific provisions for the development and consolidation of EU-wide interoperable eCall); the economic analysis for carrying out the installation action of the eCall after-market device is necessary, as this investment will contribute to the implementation and extension of the provisions contained in Article 18 a of Directive 2014/45/EU (April 3 2014), according to which: vehicles used on public roads are required to be roadworthy when they are used; the holder of the registration certificate and, where applicable, the operator of the vehicle should be responsible for keeping the vehicle in a roadworthy condition; the results of the analysis must provide reliable information on the opportunity to install the eCall based on 112 devices on all vehicles driving on European roads, regardless of their age or category.

Therefore, we note that a key measure for increasing rescue chain performance, in the event of serious accident interventions, is the large-scale installation of eCall IVS devices (Kaltenegger, Salamon, and Furian, 2018, pp. 4-5). This fact is already specified in the framework documents for regulating road traffic in the EU, in terms of improving traffic safety, such as: Regulation 2015/758/EU, regarding the mandatory installation of the device in new M1 and N1 type vehicles, starting with April 2018; Decision 585/2014/EU, with reference to the deployment of the interoperable EU-wide eCall service; Regulation 305/2013/EU, formulated on the basis of the ITS directives regarding the specifications required for the modernization of the PSAPs infrastructure, in order to improve their ability to handle eCall type calls - the receipt and the handling of eCalls; Regulation 2017/78/EU, regarding the protection of personal information; Regulation 2017/79/EU, which is destined for the elaboration and realization of the technical specifications of the eCall device and of the procedures for testing its viability.

Upon completing a meta-analysis of 88 TAM-based studies, King and He certify that TAM measures are highly reliable, presenting strong correlations, although they vary in terms of moderating variables: types of users, task types, sample size (King, 2006, p. 12). TAM relationships are also validated in taxonomy of 63 studies (Schepers and Wetzels, 2007) and further information systems and consumer behaviour literature (Orzan, Macovei, Iconaru and Perju, 2012, Perju-Mitran and Negricea, 2014). The successful applications of such studies motivated our replication of the TAM framework to adoption of the eCall IVS for aftermarket vehicles, as part our analysis. Thus, the aim of our study is twofold, namely to test and validate the applicability of TAM in explaining the intention to purchase and use (adopt) an eCall IVS, and assess the CBA scenarios in light of our study findings.

2. Brief description of eCall IVS

In this part of the study, we will insist on detailing the concept of the eCall system, functionality of the function, the implementation of technologies or other technical and legislative aspects. However, in order to facilitate the understanding and quick assimilation of the information, we will briefly present a few of the main aspects regarding the significance of the eCall IVS.

In practice there are various definitions used for this concept. For example, eCall aims to automatically initiate an emergency call from a vehicle to an operator at the common emergency number 112 in the event of a road accident (Berg Insight, 2007). From a different perspective eCall IVS is a system that is installed in vehicles having the role of transmitting an emergency signal in the event of an accident, along with information about the location and about the accident itself (McClure, Forestieri and Rook, 2016). In short, eCall is an emergency system for vehicles based on the E112 system (Brembo, 2016, p. 5).

According to sAFE, eCall is: an emergency call that can be generated through being activated by the sensors inside the vehicle (following a collision) or manually by one of the vehicle's occupants; a free service for all European citizens; when activated, the eCall from the vehicle establishes a voice connection directly with the nearest Public Safety Answering Point (PSAP) and sends a minimum set of data (MSD) to the PSAP operator receiving the voice call.

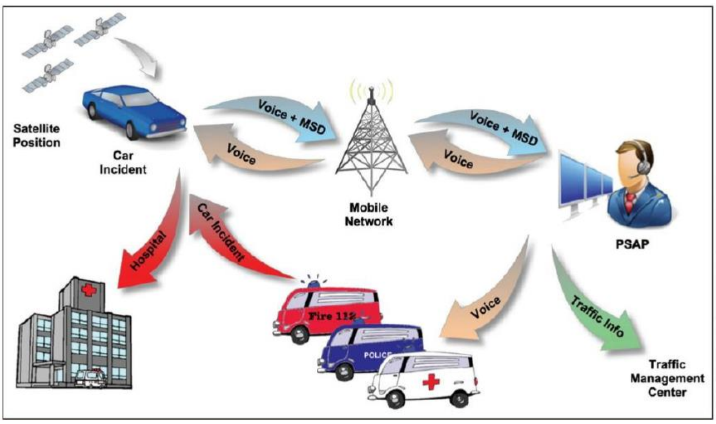

Figure 5: The operational cycle of eCall

Source: HeERO project, European Commission

Regarding MSD, they can be split into two main categories (Directorate-General for Mobility and Transport, 2019, pp. 17-18): MSD – static data, like Vehicle identification number (VIN); Vehicle propulsion storage type; Vehicle type; MSD – dynamic data, as Time stamp (trigger time); Vehicle location; Vehicle direction. The additional data needed to make the rescue measures more efficient are requested from the occupants of the vehicle by voice connection, to the extent that they can provide them (depending on the severity of the injury). In case the PSAPs operators cannot initiate and carry out a voice call with the occupants of the vehicle, because they have suffered very serious injuries or even died, standard rescue measures will be started, as they are usually carried out in these circumstances.

3. Previous research on eCall IVS based on 112

The process of choosing a research methodology (appropriate to the considered objectives) is not at all simple. The more complex the researched aspects and the larger scale the economic and social implications are on, the more difficult it is to identify the appropriate methodology. So, as a result of the literature review, it turned out that for the evaluation of the target group's opinion, the TAM model will be applied, and for the CBA implementation, the Economic Cost Benefit Analysis (ECBA) model will be applied, as recommended in the EC Guide to Cost-Benefit Analysis of Investment Projects - Economic appraisal tool for Cohesion Policy 2014-2020 (December 2014) and not only. We should mention that ECBA has already been successfully applied in previous studies on the implementation of the eCall IVS device, carried out under previous actions, funded by the European Commission (as there are C-Mobiles, eIMPACT, HeERO projects, eMERGE, and others).

An important starting point in the realization of ECBA is to take into account the provisions contained in the European eCall regulatory framework, such as: Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport entered into force, with the 'harmonized provision for an interoperable EU-wide eCall'; Regulation 758 of the European Union, issued 5 years later, respectively in 2015 (which was adopted by both the European Parliament and the Council on 29 April 2015, laying down the criteria on the basis of which the eCall IVS systems must be approved and which brought important amendments to Directive 46 of the European Council, issued in 2007); Europe on the Move, Sustainable Mobility for Europe: safe, connected and clean, Annex 1: Strategic Action Plan on Road Safety, European Commission (May 17, 2018); EU Road Safety Policy Framework 2021-2030 - Next steps towards "Vision Zero", European Commission, Commission Staff Working Document (June 19, 2019), etc.

The second important aspect we have mentioned is the consideration of the previous CBA results, achieved in the field of eCall IVS, such as: Europe (EU28) vs. Norway - Assessment of Socio-economic Impact of In-vehicle Emergency Call (eCall); Norwegian University of Science and Technology (Brembo, June 2016); Cost-benefit assesment and prioritisation of vehicle safety technologies. Final report, European Commission Directorate General Energy and Transport (January 2006); Impact Assessment, Accompanying the document Commission Recommendation on support for an EU-wide eCall service in electronic communication networks for the transmission of in-vehicle emergency calls based on 112 ('eCalls'), European Commission (September 8, 2011); Preliminary impact assessment of implementation of eCall in Hungary, eCall/HeERO (Lindenbach, December 12-13, 2013); Impact assessment on the introduction of the eCall service in all new type-approved vehicles in Europe, including liability/legal issues, Final Report, Issue 2, SMART 2008 Project Report (Lindenbach et al., September 13, 2013); Accelerating C-ITS Mobility Innovation and deployment in Europe, D2.1 Ex-ante Cost-Benefit Analysis, C-MobILE Consortium (Mitsakis and Kotsi, February 28, 2018); Cost-effectiveness analysis of policy options for the mandatory implementation of different sets of vehicle safety measures, Review of the General Safety and Pedestrian Safety Regulations, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, European Commission (Seidl et al., April 26, 2018), etc.

4. Technology Acceptance Model applied for after-market eCall IVS

One of the key concerns of this research is the need to increase the safety of road users in European Union countries. This topic is also the basic idea promoted with funding by the European Commission, and later on the implementation of the project entitled eCall device after-market; code SAFE 2018-EU-TM-0079-S. In this regard, we have in mind two issues. On the one hand, we are referring to equipping vehicles still in the manufacturing phase with the eCall IVS device. On the other hand, for the main objective of the project, we are talking about equipping vehicles already in circulation with eCall IVS, considering that this approach could have a decisive contribution in terms of reducing the number of serious accidents (causing deaths and severe injuries) which are mainly recorded in Central and Eastern Europe (according to ETSC records for 2019).

Therefore, we consider it very important to find out why consumers want to adopt and use eCall IVS devices, on the one hand, and why other consumers do not want to do so. From this perspective, there are countless studies and research endeavours focused on the perception of individuals regarding new technologies (advantages and disadvantages to be considered by them), the motivation to adopt advanced technologies, but also the barriers that stand in the way of the adoption and use of the device in their daily lives (Khare & Rakesh, 2011; Saprikis et al, 2010, etc.).

What we need to emphasize is that it is necessary to investigate the motivation that may influence them and then determine the individuals to use the eCall device. There are several elements that could stand in the way of adopting this technology, such as: lack of sufficient and quality information on the destination and role of the device; the costs involved in installing the device on board the vehicles they own (or use); lack of the skills needed to use such a device.

In some studies, the above elements are considered to be inhibitory factors, as Ajzen mentions in 1985, in his theory, called the Planned Behaviour Theory (TPB). The author developed his theory, taking into account also other elements, such as the category of facilitators (elements that determine individuals to adopt and use new technologies), but also the efficiency of their use, as it is perceived by users. Other authors, such as Rogers (1995), consider that the mere adoption of a new technology is not a guarantee that the individual will continue to use it in the future, or will decide to give up, for various reasons. From this perspective, research on post-adoption behaviour is equally important.

Fishbein and Ajzen (1975, p. 218) consider that researchers are put in extremely complicated situations when they have to identify the main concepts of life of consumers, that generates a certain attitude of individuals towards a new idea, a new theory, or a new technology.

Regarding the adoption of eCall IVS technology, we considered that the use of Davis' (1989) model, called Technology Acceptance Model, abbreviated TAM, is the most appropriate research methodology. W thus sought to investigate the basic concepts, which can convince users (they can generate a certain attitude) to adopt and use the eCall device in the vehicles they drive on European roads.

According to Davis (1989, p. 320), one of the basic elements of research is the usefulness perceived by consumers, regarding a new technology, respectively the fact that its use can bring them benefits. Other researchers, such as Said (2011) or Bosque & Crespo (2011), consider that the usefulness perceived by consumers is not a simple aspect that determines individuals to adopt and use a new device, but also a factor in the continuity of this behaviour. The main hypotheses, based on the original TAM, are shown in Figure 2.

Regarding the sampling method, we came to the conclusion that we can only use an un-probabilistic sampling method, promoted by Babbie (2022, p. 206), because given the breadth of the research it is impossible to use a well-defined sampling framework. . Therefore, according to Jackson (2012, p. 102), a very commonly used method of un-probabilistic sampling is what is called random sampling, ie the identification of respondents in certain places, that are within the reach of the researcher.

Regarding the size of the sample, it was desired that it complies with an essential requirement, respectively to allow the extrapolation of the results to the entire population considered (ie to respect the principle of representativeness). In the research we conducted, we took into account the users of road vehicles from the European Union countries. In order to achieve our goal, we based our reasoning regarding the establishment of the sample size on the concept of proportion, because it allows us to describe the studied population, taking into account certain characteristics, or rather investigated attributes, which are described in Table 1.

Symbol	Description
n	The sample size
t	The confidence level, respectively a coefficient that is associated with a probability (in this case a probability that has in view the guarantee of the results obtained as a result of the research).

p	Represents the weight of the components of the sample that can have a certain characteristic, respectively that can be characterized by a specific attribute (expressed as a percentage).
q	Represents the weight of the components of the sample that do not have a certain characteristic, respectively which can be characterized by a specific attribute (expressed as a percentage). Therefore, q = 1 - p.
e	The margin of error

Table 1 The significance of the investigated attributes

Source: Own compilation, based on literature review

For example, given that the research aims to establish the level of consumer intention regarding the use of the eCall IVS device, an essential feature or a basic attribute is the possession of a driving license (which entitles the consumer to use a road vehicle). According to the Eurostat values for 2019, the stock of road vehicles was 294,966,256 units. As a result, it is possible to calculate the share of consumers who may decide to adopt and use an eCall device. We mention that, in the same year, the EU population, according to Eurostat (2019) was estimated at 513,481,690 people.

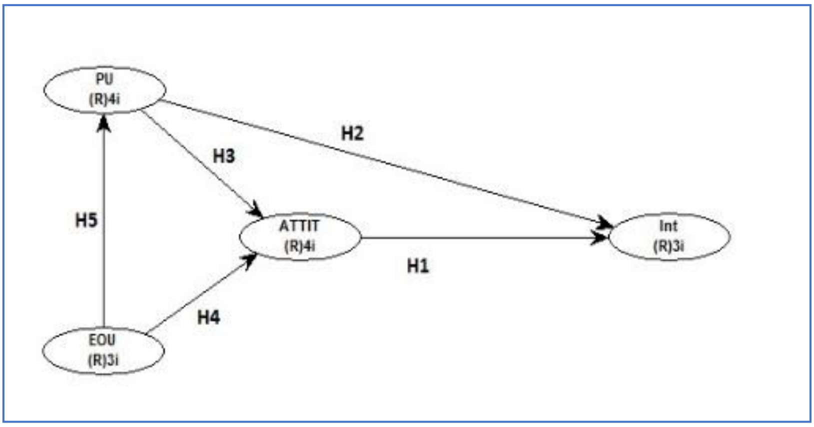

Figure 2: Model hypotheses

Source: Own assumptions, based on Davis, 1989, p. 320

Based on these official data, the following items were calculated / established:

- p = 0.575;
- q = 0.425;
- t = 0.05 (which is corresponding to a probability that is guaranteeing 99% of the results and a margin of error of +/- 5%);

- $n = \frac{2.58^2 \times 0.575 \times 0.425}{0.05^2} = \frac{1.626}{0.0025} = 650.66.$

According to the above, we estimate that the sample must be at least 651 people (called observation units), in order to be considered that the principle of representativeness is respected. In addition, in a brief description, we specify that, when establishing the conceptual model of the study, four latent variables were defined to be determined, respectively:

1. The intention of individuals (potential consumers) to purchase the eCall IVS device.

2. Consumer attitude towards the effective use of eCall IVS.

3. The usefulness of the eCall IVS device, with reference to its functions and role.

4. Ease of use of an eCall IVS device.

To determine the latent variable "consumers' intention to continue use/buy eCall" , we had to define it at both general and specific levels.

A summarized picture of the profile of the respondents can be found in Table 2. We remind you that all respondents are persons who have a driving license and have agreed to participate in completing the questionnaire.

However, current results involve **model pretesting on 256 respondents,** therefor the present study does not feature a representative sample. A representative sample with updated model results will be available on the project website (https://safe112.eu/).

Characteristics	**Percentage (%)**	**Characteristics**	**Percentage (%)**
Age		**Vehicle age**	
16 - 30	41.21	Less than 5	35.12
31 - 40	30.33	Between 5 and 10	32.36
41 - 50	14.8	Between 10 and 15	27.57
51 - 60	10.59	Over 15	4.93
Over 60	3.04	**Driving frequency**	
Prefer not to answer	0	Daily	57.91
Gender		A number of times a week	13.64
Female	45.42	A number of times a month or during the weekends	13.64

Male	54.57	Only on certain occasions, so less often than monthly	6.82
Residence		**Drive area**	
Urban	80.11	In the city/village	76.77
Rural	19.88	Outside the city/village	22.35
Vehicle type		**Vehicle type**	
Car or taxi	87.22	HGV	1.59
Motorcycle	4.2	Bus or coach	5.51
Moped	0.72	Other	0.72
Lorrie	0		

Table 2: Respondent profile

Source: Survey Data

5. The model conformity testing

According to the requirements of this type of methodology, it is necessary to validate the designed model, through the technique of interpreting the conformity indicators established for the model (the so-called model fit indices).

WarpPLS 3.0 generates three such compliance indicators: average path coefficient (APC), average R square (ARS), Average adjusted R-squared (AARS) and average variance of inflation factors (AVIF). The other calculated values are: Simpson's paradox ratio (SPR); R-squared contribution ratio (RSCR) and Statistical suppression ratio (SSR).

Model fit indices	Eligibility criterion
APC = 0.427, P < 0.001	P < 0.05
ARS=0.470, P < 0.001	P < 0.05
AARS = 0.466, P < 0.001	P < 0.05
AFVIF = 2.265	acceptable if ≤ 5, ideally ≤ 3.3
SPR = 1.000	acceptable if ≥ 0.7, ideally = 1
RSCR = 1.000	acceptable if ≥ 0.9, ideally = 1

SSR = 1.000	≥ 0.7

Table 3: The model fit and the quality indices, Source: SEM Output

Ned Kock (2012, p. 30) considers two criteria which can be used when it is desired to apply a technique for testing the conformity of the model established for conducting research, namely:

A. P values that are associated with the average link coefficient and also of R (the average square) must be less than 0.05.

B. The average variance of inflation factors must be less than 5.

The study of path coefficients and the associated p-values allows validation or rejection of hypotheses. We can see that all hypotheses are verified at a significance threshold of 0.001. Thus, it can be stated that most respondents believe that they have the skills and knowledge to use eCall based on 112 IVS. Also, the direct and positive impact of the attitude on consumers' intention to buy eCall based on 112 IVS is validated.

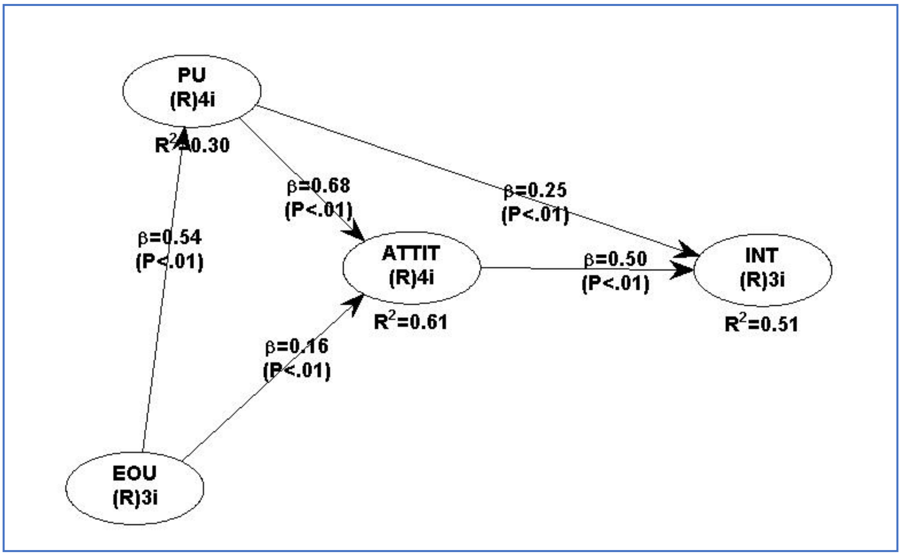

Figure 3: Model results, Source: Model estimates

6. sAFE project for eCall – Cost Benefit Analysis

An extremely important aspect is that, in accordance with the provisions of the Regulation on the approval of the device, the European Commission will have to submit, on March 31, 2021, a complete report on the achievements in the field, the penetration rate of the eCall device and the opportunity of installing the device and extending the regulation to other types of vehicles (other than M1 - passenger cars and N1 - light trucks).

Considering the objectives we have in mind for achieving the Cost Benefit Analysis (CBA), we are considering, on the one hand, road transport, and on the other hand the need to increase the safety of participants in traffic on European roads. We mention that no improvement in this field can be achieved without substantial investments (which can generate positive effects, both economic and financial).

For ECBA results to be relevant and useful to decision makers (EU regulatory bodies, national authorities, vehicle manufacturers and users etc.), we will choose the seven-step model, recommended and applied by EC through DGET, which will be adapted and supplemented both with the best practices identified in other cost-benefit analyses conducted for this technology, and with the provisions of the EU regulations in the field, which are currently applied.

The developed ECBA stages were: defining accidents relevant to the eCall technology based on 112; defining the concept of eCall technology; the scenarios for implementation; assessing the impact of eCall technology on the number of fatalities and severe injuries; identification and monetary evaluation of benefits; identification and monetary evaluation of costs; economic cost benefit assessment. In order to quantify the cumulative value of the benefits in the three scenarios, regarding the impact of eCall IVS on road fatalities and severe injuries, the following scenarios were considered:

- In the Do-nothing scenario (DNS), the annual impact on fatalities reduction to severe injury will be 3.7%, and the annual impact on severe injuries reduction to slight injury will be 5.5% (installing the eCall device is for a maximum of 10% of total EU28 passenger vehicles);
- In the Do-minimum scenario (DMS), the annual impact on fatalities reduction to severe injury will be 5%, and the annual impact on severe injuries reduction to slight injury will be 6.5% (installing the eCall device is for almost 30% of total EU28 passenger vehicles);
- In the Do-something scenario (DSS), the annual impact on fatalities reduction to severe injury will be 9%, and the annual impact on severe injuries reduction to slight injury will be 9.5% (installing the eCall device is for around 95% of total EU28 passenger vehicles).

For calculating the discounted values of the total annual costs, for the three scenarios, we used their current values, calculated for a unit price of 150 Euro, respectively 100 Euro. After calculating the discounted value of the annual benefits and costs, for each scenario option were calculated:

- Benefit-Cost Ratio BCR = (Total discounted benefits / Total discounted costs) X 100 [%].
- Net Present Value NPV = Total discounted benefits – Total discounted costs.

Following the BCR calculation for a unit cost of 150 €/unit (equal with the unit price, according to previous assumptions), we note that the only scenario for which the indicator value is greater than one (1.6) is DNS. Therefore, for the other two scenarios, at this level of annual costs, it is not appropriate to install the eCall after-market, at the level of the entire fleet of EU28 passenger vehicles, neither in the DMS nor in the DSS version.

In contrast, if we calculate BCR for a unit cost of 100 €/unit, we notice that we have two scenarios for which the result is at least equal to 1. In the DNS scenario, BCR is greater than 3 in the first eight years of forecast and equal with 3 in 2028 and 2029. But, considering that the unit price may decrease as the number of installed units' increases, we can see that this scenario is very good. Regarding DMS, the value of BCR is greater than one in the first six years and equals 1 in the rest of the period.

150€/unit				
Scenario	**Total cumulated benefits**	**Total cumulated costs**	**NPV**	**BCR**
DNS	6.020	3.450	2.570	1,75
DMS	7.419	10.301	-2.882	0,72
DSS	11.741	32.569	-20.828	0,36
150€/unit				
Scenario	**Total cumulated benefits**	**Total cumulated costs**	**NPV**	**BCR**
DNS	6.020	2.308	3.712	2,6
DMS	7.419	6.876	543	1,1
DSS	11.741	21.939	-10.198	0,5
50€/unit				
Scenario	**Total cumulated benefits**	**Total cumulated costs**	**NPV**	**BCR**
DSS	11.741	10.872	869	1,1

Table 4: NPV (Mill. €) and BCR, 2020-2029, Source: Own calculations

So, if the installation would be done at a cost less than 100 €/unit in the first interval (2020-2025), respectively at a lower value in the second interval (2026-2029), we can consider that this scenario is also appropriate. In contrast, in the third scenario (DSS), we observe that for a unit cost of 100 €/unit only a maximum of 50% of the efforts are covered (in the period 2024-2029), so this version is not appropriate. Instead, for a unit cost of 50 Euro, the third scenario can be considered, with good chances of success.

7. Conclusions

We tested the 5 main hypotheses of the study by analysing the path coefficients within the structural model, after testing the conformity of the model. Based on the values obtained for the compliance indices (APC, ARS and AVIF, as can be seen in Table 3), we can deduce that the model meets the compliance criteria. In addition, we appreciate that the model used for conducting the research has a good predictive and explanatory capacity.

To confirm the primary hypotheses of the research, we proceeded to the structural equation modelling (SEM), that is based on the analysis of variance PLS (partial least squares). Through the analysis of the standardized β coefficients (which are the path coefficients), we were able to validate all the causal relationships of the initially proposed conceptual model, and the path coefficients were significant at a chosen significance threshold of $p < 0.01$.

The analysis of the path coefficients was extremely useful in validating the primary hypotheses of the research, but they only considered the direct effect of the exogenous variables on the endogenous variables. Due to the complexity of the model and given the existence of variables with mediating effect, it is necessary to include the study of indirect effects.

Thus, the existence of indirect effects on the consumers' intention to buy / use eCall IVS with statistically significant effects will be further observed. For example, the existence of fundamental consumer beliefs that directly and indirectly influences behavioral intention (this is the case of consumer beliefs about the eCall IVS usefulness, which not only directly influences the behavioral intention, but also indirectly.

In order to have a clearer picture on the complexity of the ECBA achieved, we consider that it is necessary to briefly review the main results obtained: analysis of statistics from various databases relevant to the EU, with reference to the evolution of the passenger vehicle fleet in EU28, the number of accidents relevant to the CBA, the effects of severe accidents; forecasting the evolution of the number of passenger vehicles 2020-2029, using a well-grounded methodology, having the calculation of the Increasing Indexes of renewal rates for this category of vehicles as reference (using the latest statistics published by Eurostat); identification and evaluation in monetary terms of the benefits generated by the installation of the eCall device, and the costs incurred by the implementation of the project, by cost categories, for each scenario; valuation of the economic efficiency of the project, by calculating BCR and NPV for the 10-year forecast horizon and analysing the evolution of its annual value, for three versions of unit cost (equal with unit price), respectively 150, 100, and 50 €/unit.

However, the purpose of the decision-makers in the field of road traffic safety in the EU is to reduce the severity of the effects of road accidents, by installing the eCall device aboard passenger vehicles traveling on European roads. For this purpose, the DSS scenario version is optimal. We note that, with the unit cost reduction, the situation for DSS is becoming more and more optimistic.

In the previously considered version, we notice that for a unit cost of 50 €/unit BCR becomes greater than one over the entire forecast range. This results in a very simple aspect. The lower the unit costs, the higher the BCR value.

We recall that in this analysis we only considered the savings achieved by reducing Human costs (meaning only 88.82% of the total unit costs of fatalities, and severe injuries), without taking into account the cost elements in the Production loss, Medical costs and Administrative costs categories.

In fact, the benefits of installing the eCall device are much greater, than the elements considered so far, to maintain a prudent level of analysis (as is normal when evaluating a project as complex as the one addressed in this paper). Future research will cover the TAM confirmation on a representative sample and the possibility to extend recommendation for other vehicle types registered in the EU.

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