

D6.5 Recommendations on implementation and operation of eCall



Version number:	Version 0.5
Main author:	Risto Öörni
Dissemination level:	PU
Lead contractor:	ERTICO – ITS Europe
Due date:	31.12.2013
Delivery date:	24.03.2014
Delivery date updated document	11.06.2014



Information and Communications Technologies Policy Support Programme (the "ICT PSP")
Information Society and Media Directorate-General
Grant agreement no.: 270906
Pilot type A

Page left intentionally blank

Control sheet

Version history			
Version	Date	Main author	Summary of changes
0.1	16 th Dec 2013	Risto Öörni	Table of contents
0.2	17 th Feb 2014	Risto Öörni	Recommendations
0.3	19 th March 2014	Andy Rooke	Re-pagination
0.4	24 th March 2014	Risto Öörni Andy Rooke	Final Review
0.5	11 th June 2014	Risto Öörni	Comment removed
	Name		Date
Prepared	Risto Öörni		17/02/2014 11.06.2014
Reviewed	Andy Rooke		19/03/2014 25.06.2014
Authorised	Andy Rooke		24/03/2014 25.06.2014
Circulation			
Recipient		Date of submission	
Project partners		24/03/2014 25.06.2014	
European Commission		24/03/2014 25.06.2014	

TABLE OF CONTENTS

TERMS AND ABBREVIATIONS	6
HEERO CONTRACTUAL REFERENCES	8
1 INTRODUCTION	9
1.1 HEERO PROJECT	9
1.2 OBJECTIVES	9
1.3 BARRIERS AND ENABLERS FOR ECALL	9
TABLE OF BARRIERS AND ENABLERS	10
1.4 RECOMMENDATIONS.....	17
2 METHODS	20
2.1 OVERVIEW	20
2.2 ANALYSIS OF CHALLENGES FOR ECALL IMPLEMENTATION AND OPERATION	21
2.3 DEVELOPMENT OF RECOMMENDATIONS.....	22
3 CHALLENGES FOR DEPLOYMENT OF ECALL.....	23
3.1 CLASSIFICATION OF CHALLENGES	26
4 SOLUTIONS FOR CHALLENGES TO DEPLOYMENT.....	28
5 RECOMMENDATIONS	31
5.1 RECOMMENDATIONS FOR MEMBER STATES.....	31
5.2 RECOMMENDATIONS FOR EUROPEAN COMMISSION	32
5.3 RECOMMENDATIONS FOR STANDARDIZATION ORGANISATIONS.....	33
5.4 RECOMMENDATIONS FOR OTHER STAKEHOLDERS	33
5.5 MAPPING BETWEEN RECOMMENDATIONS AND CHALLENGES FOR IMPLEMENTATION AND OPERATION.....	34
6 CONCLUDING REMARKS	37
7 REFERENCES.....	38

Figures

FIGURE 1: STRUCTURE OF HEERO WP6 AND RELATIONS BETWEEN DELIVERABLES	20
---	----

Tables

TABLE 1: CHALLENGES FOR ECALL DEPLOYMENT AND RELATED SOLUTIONS (ÖÖRNI AND BRIZZOLARA 2014)	17
TABLE 2: SOLUTIONS TO ECALL DEPLOYMENT BARRIERS (ADAPTED FROM ÖÖRNI ET AL. 2014)	19
TABLE 3: IMPACTS OF VARIOUS CHALLENGES ON IMPLEMENTATION AND OPERATION OF ECALL	25
TABLE 4: ASSESSMENT OF SEVERITY OF CHALLENGES	27
TABLE 5: SOLUTIONS TO CHALLENGES FOR IMPLEMENTATION AND OPERATION	30
TABLE 6: RECOMMENDATIONS FOR MEMBER STATES	32
TABLE 7: RECOMMENDATIONS FOR EUROPEAN COMMISSION	33
TABLE 8: RECOMMENDATIONS FOR STANDARDS DEVELOPMENT ORGANISATIONS	33
TABLE 9: RECOMMENDATIONS FOR OTHER STAKEHOLDERS	34
TABLE 10: MAPPING OF RECOMMENDATIONS TO CHALLENGES, PART 1	35
TABLE 11: MAPPING OF RECOMMENDATIONS TO CHALLENGES, PART 2	36

Terms and abbreviations

Abbreviation	Definition
API	Application Programming Interface
CEN	Comité Européen de Normalisation
CIP	Competitiveness and Innovation Framework Programme
DoW	Description of Work
EC	European Commission
ENT	Ericsson Nikola Tesla
ERC	Emergency Rescue Centre
ETSI	European Telecommunications Standards Institute
EUCARIS	European CAR and driving license Information System
FIA	Fédération Internationale de l'Automobile
GIS	Geographic Information System
GLONASS	Russian Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HAK	Croatian Automobile Club/Hrvatskiautoklub
HGV	Heavy Goods Vehicle
HW	Hardware
ICT PSP	ICT Policy Support Programme
ICT	Information and Communications Technology
In Band Modem	The technology to transfer the MSD from the IVS to PSAP
IVS	In-Vehicle System
KPI	Key Performance Indicators

LTE	Long Term Evolution (4G mobile network)
MNO	Mobile Network Operator
MS	Member State
MSD	Minimum Set of Data
NENA	National Emergency Number Association (USA)
OEM	Original Equipment Manufacturer
P-PSAP	Primary Public Safety Answering Point
Process	The method of operation in any particular stage of development of the material part, component or assembly involved.
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
PTI	Periodical Technical Inspection
SIM	Subscriber Identity Module
SW	Software
TCP/IP	Transmission Control Protocol/Internet Protocol
TMC	Traffic Management Centre
TPS	Third Party Service
TPSP	Third Party Service Provider
UMTS	Universal Mobile Telecommunications System
VIN	Vehicle Identification Number
VoIP	Voice over Internet Protocol
WAN	Wireless Area Network
YPR	Yokosuka Research Park
Term	Definition

HeERO Contractual References

HeERO is a Pilot type A of the ICT Policy Support Programme (ICT PSP), Competitiveness and Innovation Framework Programme (CIP). The acronym stands for Harmonised eCall European Pilot.

The Grant Agreement number is 270906 and project duration is 36 months, effective from 01 January 2011 until 31 December 2013. It is a contract with the European Commission, DG CONNECT.

The principal EC Project Officer is:

Aude Zimmermann

EUROPEAN COMMISSION
DG CONNECT
Office: BU 31 – 6/35
B - 1049 Brussels
Tel: +32 296 2188
E-mail: aude.ZIMMERMANN@ec.europa.eu

One other Project Officer will follow the HeERO project:

Dimitrios AXIOTIS

E-mail: dimitris.AXIOTIS@ec.europa.eu

Address to which all deliverables and reports have to be sent:

Aude Zimmermann

EUROPEAN COMMISSION
DG CONNECT
BU 31 – 6/35
B - 1049 Brussels
Tel: +32 296 2188
E-mail: aude.ZIMMERMANN@ec.europa.eu

Any communication or request concerning the grant agreement shall identify the grant agreement number, the nature and details of the request or communication and be submitted to the following addresses:

**European Commission
DG Connect
B-1049 Brussels
Belgium**

By electronic mail: CNECT-ICT-PSP-270906@ec.europa.eu

1 Introduction

1.1 HeERO project

The aim of the HeERO project is to validate the standards of pan-European eCall and support the deployment of the service. The objective of HeERO work package WP6 is to analyse the enablers and barriers for eCall deployment, provide guidelines for eCall deployment, and create an eCall implementation roadmap and to give recommendations on the operation and implementation of eCall.

1.2 Objectives

The objective of the report is to provide recommendations for implementation and operation of eCall in Europe. The aim is that the recommendations should cover both implementation and operation of eCall, the whole eCall service chain and address actions on both European and member state level. Special attention is paid to the needs for further standardisation and guidelines.

1.3 Barriers and enablers for eCall

A summary of the challenges and enablers for eCall deployment (Table 1) has been provided in HeERO deliverable D6.2 (Öörni and Brizzolara 2014), and is reproduced in this deliverable, and shown below.

Table of Barriers and Enablers	
Identified Challenge	Identified Enablers and solutions
1.1: Challenges in gathering full support from all stakeholders (PSAP, MNO, etc.) due to lack of legislative framework or legally binding decision to implement eCall at member state level	- Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles
1.2: Stakeholders may understand standards in a different way (for example, ETSI/3GPP standards could have more clearly marked references to timers mentioned in Annex A of EN16062)	- Include references to CEN standards in the ETSI/3GPP standards, when necessary
1.3: Difficulties in assigning responsibility for eCall in a complex administrative situation	- Increasing awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs - Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles Note: solutions will likely be specific to individual member states due to differences in legal framework and roles of stakeholders.
1.4: Retrofit IVS will require a legal framework	- Provide development guidelines for retrofit IVS products; this could be a task of the EeIP task force “RETRO” - Monitor the status of retrofit IVS products and consider actions, if significant challenges or risks are encountered - Continue development of IVS certification scheme in HeERO2
1.5: eCall standards provide only few guidelines for developing the human machine interface of the IVS.	- Provide development guidelines for retrofit IVS products; this could be a task of the EeIP task force “RETRO” - Monitor the status of retrofit IVS products and consider regulatory actions, if significant challenges or risks are encountered
2.1: Limitations in scope of eCall tests (no eCall flag or real PSAP)	- Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall - Take limitations into account when interpreting the results of the pilot sites
2.2: Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)	- Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles

D6.5 Recommendations on implementation and operation of eCall

<p>2.3: Current standards do not mandate the IVS to support 3G networks</p>	<ul style="list-style-type: none"> - Further research and related road-mapping work on the long-term evolution of eCall including analysis of options available to manage the lifecycles of vehicles and wireless communication networks - Cooperation of stakeholders in the context of EeIP - Standardisation taking into account the work carried out by ETSI STF 456 and IETF working group ECRIT
<p>2.4: Implementation of eCall affecting several players is a difficult organisational issue</p>	<ul style="list-style-type: none"> - Identification of a key stakeholder which monitors and possibly also coordinates the overall process towards eCall deployment and formally or informally takes responsibility for solving problems and keeping the process moving - The roles of different stakeholders should be clearly defined; this can be achieved with a national eCall roadmap or an implementation plan - Increasing awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs
<p>2.5: Different competences of different players</p>	<ul style="list-style-type: none"> - Mutual cooperation and technical support between stakeholders within a member state - The roles of different stakeholders should be clearly defined; this can be achieved with a national eCall roadmap or an implementation plan
<p>2.6: Insufficient awareness of stakeholders (decision-makers) on eCall</p>	<ul style="list-style-type: none"> - Dissemination activities of HeERO projects, EeIP and iMobility Challenge - Organisation of round table discussions and working groups on member state level - Creating and publishing a national eCall implementation roadmap or implementation plan - Dissemination of information on the impacts of eCall (http://www.imobility-effects-database.org)
<p>2.7: PSAPs in a member state have very different technical infrastructure</p>	<ul style="list-style-type: none"> - Analysis of the architectural and deployment options available building on the experiences from HeERO and HeERO2 projects - Centralisation of reception and handling of eCalls to a few key PSAPs – at least as an interim solution - Development of a national eCall roadmap or a national eCall implementation plan

D6.5 Recommendations on implementation and operation of eCall

<p>2.8: HeERO pilot sites and HeERO partners dependent on resources or technical support from outside the consortium</p>	<p>Note: this challenge is mostly related to piloting and is expected to be less important when the actual deployment of eCall is taking place because of the direct involvement of PSAPs and MNOs. This challenge was specific to HeERO project and overlapping with other challenges identified. Therefore, it is covered by summaries of other challenges and related enablers.</p>
<p>2.9: Consequences of eCall for third party services are unknown</p>	<p>- Member states may decide to support TPS-eCall in their PSAPs using the interfaces defined in EN16102.</p> <p>Note: Third party services are typically offered as a part of a larger service package. Pan-European eCall is not a direct substitute for the third party services already on the market, and the fleet penetration of third party services in new vehicles is relatively small. This suggests that the impact of pan-European eCall on the existing private services would be limited on the European level.</p>
<p>2.10: Availability of conformance test specification</p>	<p>- Development of CEN TS 16454 into an European Standard</p>
<p>2.11: Performance and reliability of eCall are lower in rural areas than in urban areas</p>	<ul style="list-style-type: none"> - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall - Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed - Analyse the reliability of eCall on member state level and the factors contributing to it. Implement necessary changes to the communication networks or to the PSAP (for example, changes to codecs used or transcoding between codecs along the call path from IVS to PSAP) - Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary
<p>2.12: There is currently no way to check the functionality of the IVS except making a false eCall. The final version of the proposal for PTI of the IVS is not yet available</p>	<ul style="list-style-type: none"> - Continue the work of the PTI task force of the EeIP - Implementation of the self-test feature of the IVS; this is mandated in Chapter 7.1.5 of EN16062: "On power up, the IVS shall normally perform a self-test without attempting to connect to the network..." - Implement changes to standards of eCall, if required

<p>2.13: PSAPs in member states need updates which may be difficult to complete until 1st October 2015</p>	<ul style="list-style-type: none"> - Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCalls to one PSAP equipped with eCall) - The schedule of deployment and the actions required should be defined in a national eCall roadmap or an implementation plan - Increasing awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs - Results for HeERO and HeERO2 projects will support deployment of eCall in shortest possible time - Monitoring of eCall deployment based on the European ITS directive
<p>2.14: Limitations of interoperability tests (remote tests are not equivalent to local tests)</p>	<ul style="list-style-type: none"> - Interoperability tests can be integrated with eCall end-to-end tests to be performed by member state level - Effective sharing and publication of the results of the interoperability tests to be carried out after HeERO and HeERO2 projects – for example in the context of the EeIP or international eCall conferences to be organised - Continue eCall test-fest activities to provide platform for interoperability testing
<p>2.15: It is not fully clear who will purchase and install the SIM card to the IVS</p>	<ul style="list-style-type: none"> - Definition of a certification procedure of eCall IVS and finalising vehicle type-approval requirements - Analyse the availability of dormant SIM cards and then decide on the actions necessary
<p>3.1: Organisational or technical changes in PSAP simultaneously with eCall deployment</p>	<ul style="list-style-type: none"> - Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCalls to one PSAP equipped with eCall) - The schedule of deployment and the actions required should be defined in a national eCall roadmap or an implementation plan
<p>3.2: PSAPs do not have personnel resources to manage eCalls in other languages</p>	<ul style="list-style-type: none"> - Appropriate call handling procedures should be defined at member state level (for example, opening a conference call between the IVS, PSAP and staff speaking the language of the vehicle occupants and use of information in the MSD) - Information included in the MSD is available even in cases in which it is not possible to obtain additional information from the vehicle occupants

D6.5 Recommendations on implementation and operation of eCall

3.3: Possible false alarms from eCall enabled vehicles	<ul style="list-style-type: none"> - Development of certification scheme for eCall IVS - Provision of development guidelines for IVS – especially for the automatic and manual triggering features - Education of car users on the operation and correct use of eCall - Validation of incoming calls before connecting them to a PSAP operator
3.4: Call routing plan is required to route manual and automatic eCalls to correct places	- Define call routing in a national eCall implementation roadmap or eCall implementation plan
3.5: Planned software update in the mobile network interfered with HeERO tests	Note: this challenge is related to HeERO tests but is not expected to affect the actual operation of eCall
3.6 All the staff in PSAPs have not been trained to handle eCalls	<ul style="list-style-type: none"> - Training of PSAP staff - Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCalls to one PSAP with trained staff)
3.7: Silent calls	<ul style="list-style-type: none"> - Appropriate call handling procedures to be defined at member state level - Use of information available via voice connection (background noise etc.) - Utilisation of information available in MSD - Use of network based positioning to validate location of the caller (available for all E112 calls)
3.8: Operational questions in call handling (noise, silent calls, queuing of calls, answering and eCall with failed MSD transmission etc.)	- Appropriate call handling procedures to be defined at member state level (use the guidelines from EeIP and results of the HeERO and HeERO2 projects)
4.1: Unavailability of IVS prototypes in the beginning of the HeERO pilot	Note: this challenge is not expected to be relevant in current situation with many IVS prototypes available.
4.2: Weaknesses in IVS implementation	<ul style="list-style-type: none"> - Development of certification scheme for eCall IVS - Development of certification scheme for the components implementing the eCall in-band modem - Continuation of the eCall test-fest events - Further analysis of the weaknesses identified but not analysed in detail in HeERO project - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall
4.3: Problems with mobile network coverage or signal strength	- Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary, this is not just confined to eCall.

D6.5 Recommendations on implementation and operation of eCall Harmonised eCall European Pilot

<p>4.4: Time synchronisation between IVS and PSAP is required to calculate several HeERO KPIs</p>	<p>- Synchronisation of PSAP clock using NTP (network time protocol), GPS or some other means to an accurate time reference Note: this challenge is related to calculation of HeERO KPIs but not to the operation of eCall</p>
<p>4.5: Increased duration of MSD transmission and call setup when testing with a moving vehicle</p>	<p>- See challenge 4.10</p>
<p>4.6: Repeated MSD update request by PSAP not possible</p>	<p>- Further analysis of the scope of the problem and corrective actions if necessary - Development of a certification scheme for eCall IVS and the in-band modem components Note: this challenge is likely related to an individual IVS or PSAP implementation</p>
<p>4.7: Mobile network echo cancellers have an adverse effect on MSD transmission</p>	<p>- Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed</p>
<p>4.8: False eCalls generated by mobile phones which erroneously activate eCall flag</p>	<p>- Documentation of the erroneous operation of the mobile phones affected by the problem and contacting the equipment manufacturers, this matter is in the hands of GSMA and ETSI</p>
<p>4.9: Voice channel blocking time longer than expected</p>	<p>see challenge 4.10</p>
<p>4.10: MSD transmission times have been longer than the target value for eCall at least at some pilot sites</p>	<p>- Study the possibilities to reduce voice channel blocking time by optimising the acknowledgement mechanism of eCall MSD transmission - Analyse the reason for the difference in the results measured in laboratory environment and results measured in real-life networks - Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed</p>
<p>4.11: Inaccuracies in the MSD standard (EN15722)</p>	<p>- Update the annex A of EN15722 or add an errata to the standard</p>
<p>4.12: Differences between performance of IVS even if IVS conform to standards</p>	<p>see challenge 4.19</p>
<p>4.13: eCall may end up as a “silent call” with no voice connection, if eCall flag not implemented</p>	<p>- Further analysis of the scope of the problem and corrective actions if necessary</p>
<p>4.14: Lower than expected robustness of in-band modem</p>	<p>see challenge 4.19</p>

D6.5 Recommendations on implementation and operation of eCall

<p>4.15: Some PLMNs may have problems in handling long numbers of the SIM cards of the IVS</p>	<ul style="list-style-type: none"> - Software update of mobile network elements will likely solve the problem Note: this is a problem with implementation of the standards of mobile networks and not specific to eCall
<p>4.16: Long time needed for network registration and call setup when IVS activated in dormant mode; possibly has an impact on the number of silent calls</p>	<ul style="list-style-type: none"> - When in inactive state, the IVS “shall periodically scan and maintain a list of available PLMNs” to reduce the network registration and call setup time (EN16062, Chapter 7.1.6) - Educate car users on the functionality and correct use of eCall
<p>4.17: Satellite based positioning techniques do not function properly in tunnels</p>	<ul style="list-style-type: none"> - Use of pseudolites in tunnels and in other underground spaces - Dead-reckoning combined with GNSS - Use of network based positioning of E112 emergency calls
<p>4.18: There are no guidelines or target values for MSD success rate acceptable for eCall</p>	<ul style="list-style-type: none"> - Development of guidelines on the service quality acceptable for eCall service
<p>4.19: MSD transmission is not always successful</p>	<ul style="list-style-type: none"> - PSAP initiates a retransmission of the MSD in case the first transmission is not successful - PSAP uses the voice connection to communicate with vehicle occupants - Possibility that the MSD transmission fails should be taken into account in operation of eCall and related guidelines - Further analysis on correlation of the outcomes of individual MSD transmissions during the same call should be carried out - Development of certification scheme for eCall IVS - Development of certification scheme for the components implementing the eCall in-band modem - Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall - Further analysis of the factors which contributed to MSD success rate in the HeERO pilots should be carried out to increase the reliability of MSD transmission
<p>5.1: Consumers or the media confuse eCall with other in-vehicle emergency call services</p>	<ul style="list-style-type: none"> - Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP
<p>5.2: Misuse of eCall</p>	<ul style="list-style-type: none"> - Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP

5.3: Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles	- Educate car users on the functionality and correct use of eCall; public awareness campaigns organised by member states with support of EC and EeIP
--	--

Table 1: Challenges for eCall deployment and related solutions (Öörni and Brizzolara 2014)

The other work packages of HeERO have planned and implemented eCall in member states participating in HeERO, operated the pilots, evaluated them using a common set of key performance indicators and disseminated the results.

However, deliverable D6.2 identifies the challenges but it does not include any detailed analysis of the challenges encountered such as in terms of their impacts. In addition, it provides solutions separately for each individual challenge but does not attempt to provide a coherent and internally consistent set of recommendations for actions carried out to achieve a fully operational eCall in Europe.

1.4 Recommendations

The eCall pilots realised in HeERO countries – Finland, Czech Republic, Croatia, Germany, Greece, Italy, Netherlands, Romania and Sweden – have provided information on the technical functioning of eCall, the deployment process and implementation options available, barriers and enablers for implementation and operation and solutions to the challenges identified during the project. This knowledge has been documented in the deliverables of HeERO, but no one of the earlier reports has provided a set of recommendations addressing the whole deployment process, technical and non-technical aspects including both implementation and operation of the service.

HeERO WP6 has also provided guidelines intended for member states or other countries planning to implement eCall including a list of barriers and solutions for operation and implementation of eCall (Table 2). However, these guidelines have their main focus on challenges which are encountered and can be addressed on member state level. Therefore, they provide recommendations for actions on member state level but are not enough as such as recommendations for implementation and operation.

Barrier	Solution(s)
The awareness of decision makers on the impacts of eCall and potential implementation options is insufficient.	<ul style="list-style-type: none"> - Organise round table discussions and working groups on eCall - Study the implementation options available. Utilize the results of HeERO and HeERO2 projects, standards, and literature on the topic. - Disseminate information on the impacts of eCall. Utilize the materials provided by HeERO, HeERO2, eCall Implementation Platform, iMobility effects database (http://www.imobility-effects-database.org) and iMobility Challenge

D6.5 Recommendations on implementation and operation of eCall

Barrier	Solution(s)
	<ul style="list-style-type: none"> - Create and publish a national eCall implementation roadmap or implementation plan
It is difficult to assign responsibility for eCall in a complex administrative situation.	<ul style="list-style-type: none"> - Increase the awareness of key stakeholders on the implementation options available and the benefits and costs of eCall. - Completion of European level regulation which mandates the implementation of eCall in PSAPs, communication networks and new type-approved vehicles
There is no full support from all key stakeholders due to lack of legislative framework for eCall in member state or a legally binding decision to implement eCall.	<ul style="list-style-type: none"> - Completion of European level regulation which mandates the implementation of eCall in PSAPs, communication networks and new type-approved vehicles
Implementation of eCall affecting several players is a difficult organisational issue.	<ul style="list-style-type: none"> - Identify the organisation which monitors the deployment process and informally or formally takes responsibility for solving problems and keeping the process moving - Communicate the impacts and implementation options for eCall to the key stakeholders - Define the roles of the stakeholders in a national eCall roadmap or implementation plan
PSAPs have very different technical infrastructure.	<ul style="list-style-type: none"> - Analyse the architectural and deployment options available, utilize the results of HeERO and HeERO2 projects - Consider centralisation of reception and handling of eCalls to a few key PSAPs – at least as an interim solution - Develop a national eCall roadmap or implementation plan
It is difficult to complete the updates to PSAPs in time.	<ul style="list-style-type: none"> - Temporary arrangements may be used in situations in which all PSAPs are not yet ready to process eCalls (for example, centralised handling of eCalls in a few key PSAPs) - Define the schedule for deployment and the actions required in a national eCall roadmap or an implementation plan
There are organisational or technical changes in PSAPs simultaneously with eCall deployment.	<ul style="list-style-type: none"> - Temporary arrangements may be used in situations in which all PSAPs are not yet ready to process eCalls (for example, centralised handling of eCalls in a few key PSAPs) - Define the schedule for deployment and the actions required in a national eCall roadmap or an implementation plan
The staff in PSAPs' has not been trained to handle eCalls.	<ul style="list-style-type: none"> - Provide training for PSAP staff - Temporary arrangements may be used in situations in which all PSAPs are not yet ready to process eCalls (for example, centralised handling of eCalls in a few key PSAPs)
MSD transmission is not always successful	<ul style="list-style-type: none"> - Initiate a MSD retransmission when the first MSD transmission in the beginning of the connection fails. - Use the voice connection to communicate with vehicle occupants. - Perform end-to-end tests for the whole eCall service chain to ensure correct functioning and reliable operation of eCall. - Support development of certification scheme for eCall IVS and eCall in-band modem components. - Failed MSD transmissions should be taken into account when preparing guidelines for operation of eCall such as when developing call handling and risk assessment procedures for PSAPs.
Voice channel blocking time is longer than expected	<ul style="list-style-type: none"> - Reduce the number of link layer acknowledgements (LL-ACKs) transmitted by the PSAP after a successful MSD transmission.
Silent calls	<ul style="list-style-type: none"> - Define appropriate call handling procedures for silent

Barrier	Solution(s)
	<ul style="list-style-type: none"> - eCalls. - Use the information available via voice connection such as background noise. - Use the information included in the MSD. - Validate the location of the caller using network based positioning available for all E112 calls.
False eCalls from eCall enabled vehicles	<ul style="list-style-type: none"> - Educate car users on the operation and correct use of eCall with information campaigns. - Support development of certification scheme for eCall IVS. - If necessary, implement validation of incoming calls before connecting them to a PSAP operator.
False eCalls generated by mobile phones which erroneously activate the eCall flag	<ul style="list-style-type: none"> - Document the erroneous operation of mobile phone models affected by the problem and contact the equipment manufacturers.
Weaknesses in IVS implementations	<ul style="list-style-type: none"> - Support development of certification scheme for eCall IVS and eCall in-band modem components. - Encourage participation in eCall interoperability events. - Perform end-to-end tests for the whole eCall service chain to ensure correct functioning and reliable operation of eCall.
Problems with mobile network coverage or signal strength	<ul style="list-style-type: none"> - Monitor the service quality of E112 emergency calls. - Analyse the status of national regulations concerning the coverage of mobile networks and handling of 112 emergency calls. Implement changes, if necessary. -
Mobile network echo cancellers have an adverse effect on MSD transmission.	<ul style="list-style-type: none"> - Analyse the effect of network echo canceller disabling tone on the reliability of MSD transmission. - Implement network echo canceller disabling tone in PSAPs, if the analysis shows potential for improvement.
Some public land mobile networks (PLMNs) have problems in handling long numbers of the SIM cards used by eCall IVSs.	<ul style="list-style-type: none"> - The problem can likely be solved with a software update of the mobile network affected by the problem <p>Note: this is a problem with implementation of the standards of the mobile networks and not specific to eCall.</p>
Consumers or the media confuse eCall with other in-vehicle emergency call services.	<ul style="list-style-type: none"> - Educate car users on the operation and correct use of eCall with information campaigns.
Misuse of eCall	<ul style="list-style-type: none"> - Educate car users on the operation and correct use of eCall with information campaigns. <p>Note: procedures for dealing with abuse of emergency number 112 are specific to member state</p>
Car users are concerned of potential for privacy violations, risk of supervision and tracking of individual vehicles.	<ul style="list-style-type: none"> - Educate car users on the operation and correct use of eCall with information campaigns.

Table 2: Solutions to eCall deployment barriers (adapted from Öörni et al. 2014)

HeERO has also acted as a platform for cooperation between the pilot sites and the member states the pilot sites are located in. After the HeERO project has ended, there is a clear need to share the results of the HeERO project as well as the recommendations based on the results of the project.

2 Methods

2.1 Overview

The overall structure of HeERO WP6 is illustrated in Figure 1.

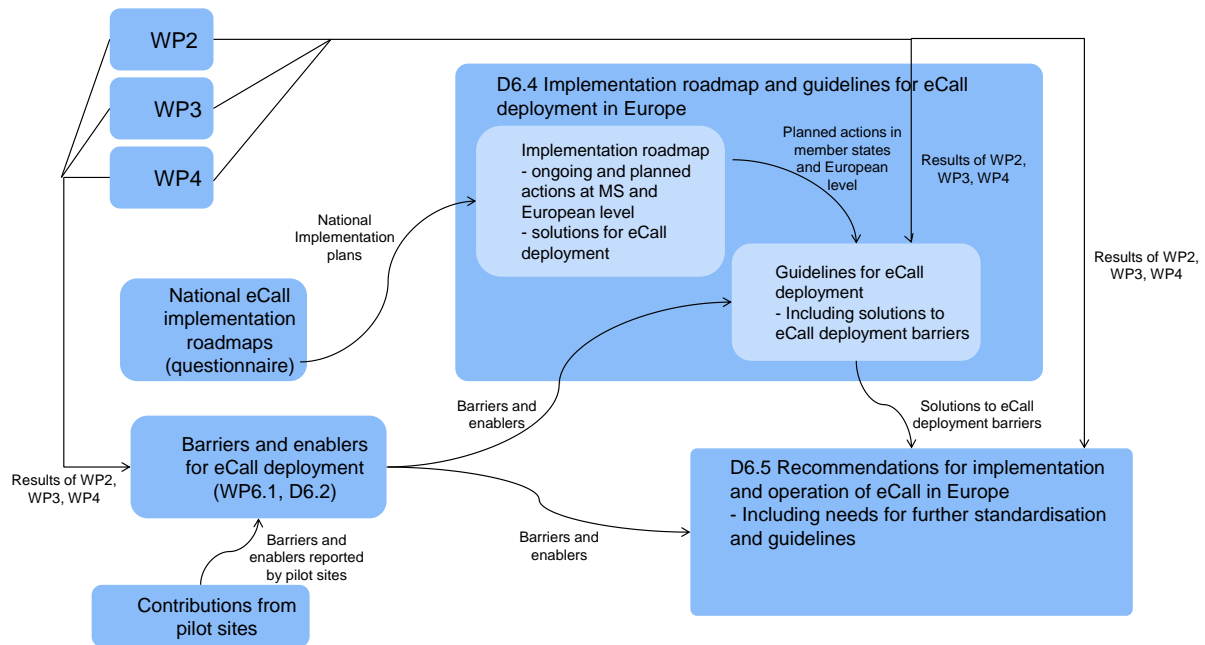


Figure 1: Structure of HeERO WP6 and relations between deliverables

The development of recommendation is based on both the barriers and enablers identified for eCall deployment in WP6.1 and reported in deliverable D6.2 (Öörni and Brizzolara 2014), on the solutions drafted in guidelines for eCall deployment (Öörni et al. 2014) in HeERO deliverable D6.4 and inputs from other HeERO work packages such as WP2, WP3 and WP4.

The barriers for implementation and operation of eCall (Table 1) have been obtained directly from HeERO D6.2 where they have been identified on the basis of reports from pilot sites and other information and reported in a systematic way. The barriers for eCall implementation are also referred as challenges in deliverables of HeERO WP6.

The enablers for eCall deployment can be understood as solutions to the challenges identified. In addition to the challenges, deliverable D6.2 includes also the solutions addressing the challenges (Table 1).

2.2 Analysis of challenges for eCall implementation and operation

The work was started with a brief analysis of the challenges for implementation and operation of eCall. The challenges were analysed in terms of their impact, expected severity and relevance outside the HeERO project.

The challenges were first classified with their potential impact on the implementation and operation of eCall. The impacts of the challenges were classified into the following categories:

- implementation of a complete eCall service chain is not possible
- reduction in service quality or reliability
- cost overrun
- delay in implementation
- reduction in service benefits
- user issues

The severity of the challenges was assessed using three categories. Challenges having potential to completely prevent eCall deployment or operation were classified into the 'High' category. Challenges with any significant potential for adverse impacts on implementation and operation of eCall but not likely preventing the implementation and operation of eCall were classified into 'Moderate' category. Challenges which were considered to have only minor impact on eCall were classified into 'Low' category. Challenges with potential to

prevent the implementation of a full eCall service chain were classified as ‘High’ or ‘Moderate’ in terms of severity.

Challenges relevant only within the HeERO project were not assumed to be relevant during the actual deployment. For these challenges, it was assumed that there is no need to address them with the recommendations to be provided.

2.3 Development of recommendations

The recommendations were developed on the basis of solutions identified in HeERO D6.2. When developing the recommendations, the main focus was on the recommendations to challenges classified in the category of ‘High’ severity. The recommendations were described separately for each type of stakeholder to ensure that they would be as accurate and relevant as possible.

3 Challenges for deployment of eCall

A classification of the challenges of implementation and operation of eCall in terms of their impacts and relevancy outside the HeERO project is provided in Table 3.

Challenge		Impacts						Relevance	
		Implementation of a complete eCall service chain is not possible	Reduction in service quality or reliability	Cost overrun or cost increase	Delay in implementation	Reduction in service benefits	Reduced user acceptance	Other	Relevant outside HeERO?
1.1	Challenges in gathering full support from all stakeholders (PSAP, MNO, etc.) due to lack of legislative framework or legally binding decision to implement eCall at member state level								Yes
1.2	Stakeholders may understand standards in a different way (for example, ETSI/3GPP standards could have more clearly marked references to timers mentioned in Annex A of EN16062)								Yes
1.3	Difficulties in assigning responsibility for eCall in a complex administrative situation								Yes
1.4	Retrofit IVS will require a legal framework								Yes
1.5	eCall standards provide only few guidelines for developing the human machine interface of the IVS.								Yes
2.1	Limitations in scope of eCall tests (no eCall flag or real PSAP)								Yes
2.2	Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)								Yes
2.3	Current standards do not mandate the IVS to support 3G networks								Yes
2.4	Implementation of eCall affecting several players is a difficult organisational issue								Yes
2.5	Different competences of different players								Yes
2.6	Insufficient awareness of stakeholders (decision-makers) on eCall								Yes
2.7	PSAPs in a member state have very different technical infrastructure								Yes
2.8	HeERO pilot sites and HeERO partners dependent on resources or technical support from outside the consortium								No
2.9	Consequences of eCall for third party services are unknown								Yes
2.10	Availability of conformance test specification								Yes
2.11	Performance and reliability of eCall are lower in rural areas than in urban areas								Yes
2.12	There is currently no way to check the functionality of the IVS except making a								Yes

D6.5 Recommendations on implementation and operation of eCall

Challenge	Impacts							Relevance
	Implementation of a complete eCall service chain is not possible	Reduction in service quality or reliability	Cost overrun or cost increase	Delay in implementation	Reduction in service benefits	Reduced user acceptance	Other	
	false eCall. The final version of the proposal for PTI of the IVS is not yet available							
2.13	PSAPs in member states need updates which may be difficult to complete until 1st October 2015							Yes
2.14	Limitations of interoperability tests (remote tests are not equivalent to local tests)							Yes
2.15	It is not fully clear who will purchase and install the SIM card to the IVS							Yes
3.1	Organisational or technical changes in PSAP simultaneously with eCall deployment							Yes
3.2	PSAPs do not have personnel resources to manage eCalls in other languages							Yes
3.3	Possible false alarms from eCall enabled vehicles							Yes
3.4	Call routing plan is required to route manual and automatic eCalls to correct places							Yes
3.5	Planned software update in the mobile network interfered with HeERO tests							No
3.6	All the staff in PSAPs have not been trained to handle eCalls							Yes
3.7	Silent calls							Yes
3.8	Operational questions in call handling (noise, silent calls, queuing of calls, answering and eCall with failed MSD transmission etc.)							Yes
4.1	Unavailability of IVS prototypes in the beginning of the HeERO pilot							No
4.2	Weaknesses in IVS implementation							Yes
4.3	Problems with mobile network coverage or signal strength							Yes
4.4	Time synchronisation between IVS and PSAP is required to calculate several HeERO KPIs							No
4.5	Increased duration of MSD transmission and call setup when testing with a moving vehicle							Yes
4.6	Repeated MSD update request by PSAP not possible							Yes
4.7	Mobile network echo cancellers have an adverse effect on MSD transmission							Yes
4.8	False eCalls generated by mobile phones which erroneously activate eCall flag							Yes
4.9	Voice channel blocking time longer than							Yes

Challenge		Impacts							Relevance
		Implementation of a complete eCall service chain is not possible	Reduction in service quality or reliability	Cost overrun or cost increase	Delay in implementation	Reduction in service benefits	Reduced user acceptance	Other	Relevant outside HeERO?
	expected								
4.10	MSD transmission times have been longer than the target value for eCall at least at some pilot sites								Yes
4.11	Inaccuracies in the MSD standard (EN15722)								Yes
4.12	Differences between performance of IVS even if IVS conform to standards								Yes
4.13	eCall may end up as a "silent call" with no voice connection, if eCall flag not implemented								Yes
4.14	Lower than expected robustness of in-band modem								Yes
4.15	Some PLMNs may have problems in handling long numbers of the SIM cards of the IVS								Yes
4.16	Long time needed for network registration and call setup when IVS activated in dormant mode; possibly has an impact on the number of silent calls								Yes
4.17	Satellite based positioning techniques do not function properly in tunnels								Yes
4.18	There are no guidelines or target values for MSD success rate acceptable for eCall								Yes
4.19	MSD transmission is not always successful								Yes
5.1	Consumers or the media confuse eCall with other in-vehicle emergency call services								Yes
5.2	Misuse of eCall								Yes
5.3	Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles								Yes

Table 3: Impacts of various challenges on implementation and operation of eCall

3.1 Classification of challenges

Classification of challenges in terms of their severity is provided in Table 4. Only challenges which are relevant outside the HeERO project are included in the analysis.

Challenge	Severity			Notes
	High	Moderate	Low	
1.1	Challenges in gathering full support from all stakeholders (PSAP, MNO, etc.) due to lack of legislative framework or legally binding decision to implement eCall at member state level			
1.2	Stakeholders may understand standards in a different way (for example, ETSI/3GPP standards could have more clearly marked references to timers mentioned in Annex A of EN16062)			
1.3	Difficulties in assigning responsibility for eCall in a complex administrative situation			
1.4	Retrofit IVS will require a legal framework			
1.5	eCall standards provide only few guidelines for developing the human machine interface of the IVS.			
2.1	Limitations in scope of eCall tests (no eCall flag or real PSAP)			
2.2	Lack of commitment of IVS developers due to perceived lack of business case (waiting for a clear decision or government subsidies)			
2.3	Current standards do not mandate the IVS to support 3G networks			
2.4	Implementation of eCall affecting several players is a difficult organisational issue			
2.5	Different competences of different players			
2.6	Insufficient awareness of stakeholders (decision-makers) on eCall			
2.7	PSAPs in a member state have very different technical infrastructure			
2.9	Consequences of eCall for third party services are unknown			
2.10	Availability of conformance test specification			
2.11	Performance and reliability of eCall are lower in rural areas than in urban areas			
2.12	There is currently no way to check the functionality of the IVS except making a false eCall. The final version of the proposal for PTI of the IVS is not yet available			
2.13	PSAPs in member states need updates which may be difficult to complete until 1st October 2015			
2.14	Limitations of interoperability tests (remote tests are not equivalent to local tests)			
2.15	It is not fully clear who will purchase and install the SIM card to the IVS			
3.1	Organisational or technical changes in PSAP simultaneously with eCall deployment			

D6.5 Recommendations on implementation and operation of eCall

3.2	PSAPs do not have personnel resources to manage eCalls in other languages				
3.3	Possible false alarms from eCall enabled vehicles				
3.4	Call routing plan is required to route manual and automatic eCalls to correct places				
3.6	All the staff in PSAPs have not been trained to handle eCalls				
3.7	Silent calls				
3.8	Operational questions in call handling (noise, silent calls, queuing of calls, answering and eCall with failed MSD transmission etc.)				
4.2	Weaknesses in IVS implementation				
4.3	Problems with mobile network coverage or signal strength				
4.5	Increased duration of MSD transmission and call setup when testing with a moving vehicle				
4.6	Repeated MSD update request by PSAP not possible				
4.7	Mobile network echo cancellers have an adverse effect on MSD transmission				
4.8	False eCalls generated by mobile phones which erroneously activate eCall flag				
4.9	Voice channel blocking time longer than expected				
4.10	MSD transmission times have been longer than the target value for eCall at least at some pilot sites				
4.11	Inaccuracies in the MSD standard (EN15722)				
4.12	Differences between performance of IVS even if IVS conform to standards				
4.13	eCall may end up as a "silent call" with no voice connection, if eCall flag not implemented				
4.14	Lower than expected robustness of in-band modem				
4.15	Some PLMNs may have problems in handling long numbers of the SIM cards of the IVS				
4.16	Long time needed for network registration and call setup when IVS activated in dormant mode; possibly has an impact on the number of silent calls				
4.17	Satellite based positioning techniques do not function properly in tunnels				
4.18	There are no guidelines or target values for MSD success rate acceptable for eCall				
4.19	MSD transmission is not always successful				
5.1	Consumers or the media confuse eCall with other in-vehicle emergency call services				
5.2	Misuse of eCall				
5.3	Users' concerns of privacy violations and risk of supervision and tracking of individual vehicles				

Table 4: Assessment of severity of challenges

4 Solutions for challenges to deployment

The solutions to the challenges identified in D6.2 are presented in Table 5. The solutions have been obtained from D6.2 and D6.4 (Table 1 and Table 2). The solutions have been classified into three categories: solutions to be implemented on member state level, solutions to be implemented on European level and solutions which can be implemented on both member state and European levels or require cooperation of both types of stakeholders. In addition, solutions 66 and 67 have been obtained from discussions with HeERO partners.

Solution		Scope	
Number	Description	European level	Member state
1	Completion of European level regulation which mandates implementation of eCall in PSAPs, communication networks and new type-approved vehicles	X	
2	Include references to CEN standards in the ETSI/3GPP standards, when necessary	X	
3	Increasing awareness of stakeholders on member state level on the options available for implementation of eCall and the related benefits and costs		X
4	Provide development guidelines for retrofit IVS products; this could be a task of the EeIP task force "RETRO"	X	
5	Monitor the status of retrofit IVS products and consider actions, if significant challenges or risks are encountered	X	X
6	Continue development of IVS certification scheme in HeERO2	X	
7	Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall		X
8	Take the limitations of the HeERO tests into account when interpreting the results of the pilot sites	X	X
9	Further research and related road-mapping work on the long-term evolution of eCall including analysis of options available to manage the lifecycles of vehicles and wireless communication networks	X	
10	Cooperation of stakeholders in the context of EeIP	X	X
11	Standardisation taking into account the work carried out by ETSI STF 456 and IETF working group ECRIT	X	
12	Identification of a key stakeholder which monitors and possibly also coordinates the overall process towards eCall deployment and formally or informally takes responsibility for solving problems and keeping the process moving		X
13	The roles of different stakeholders should be clearly defined; this can be achieved with a national eCall roadmap or an implementation plan		X
14	Mutual cooperation and technical support between stakeholders within a member state		X
15	Dissemination activities of HeERO projects, EeIP and iMobility Challenge	X	
16	Organisation of round table discussions and working groups on member state level		X
17	Creating and publishing a national eCall implementation roadmap or implementation plan		X
18	Dissemination of information on the impacts of eCall (http://www.imobility-effects-database.org)	X	
19	Analysis of the architectural and deployment options available building on the experiences from HeERO and HeERO2 projects		X
20	Centralisation of reception and handling of eCalls to a few key PSAPs – at least as an interim solution		X
21	Member states may decide to support TPS-eCall in their PSAPs using the interfaces defined in EN16102.		X
22	Development of CEN TS 16454 into an European Standard	X	

D6.5 Recommendations on implementation and operation of eCall Harmonised eCall European Pilot

23	Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed		X
24	Analyse the reliability of eCall on member state level and the factors contributing to it. Implement necessary changes to the communication networks or to the PSAP (for example, changes to codecs used or transcoding between codecs along the call path from IVS to PSAP)		X
25	Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary		X
26	Continue the work of the PTI task force of the EeIP	X	
27	Implementation of the self-test feature of the IVS; this is mandated in Chapter 7.1.5 of EN16062: "On power up, the IVS shall normally perform a self-test without attempting to connect to the network..."	X	X
28	Implement changes to standards of eCall, if required to allow periodic technical inspection	X	
29	Temporary arrangements may be used to have eCall available in a situation in which all PSAPs have not been updated yet (for example, routing all eCalls to one PSAP equipped with eCall)		X
30	The schedule of deployment and the actions required should be defined in a national eCall roadmap or an implementation plan		X
31	Results for HeERO and HeERO2 projects will support deployment of eCall in shortest possible time		X
32	Monitoring of eCall deployment based on the European ITS directive	X	
33	Interoperability tests can be integrated with eCall end-to-end tests to be performed by member state level		X
34	Effective sharing and publication of the results of the interoperability tests to be carried out after HeERO and HeERO2 projects – for example in the context of the EeIP or international eCall conferences to be organised	X	X
35	Continue eCall testfest activities to provide platform for interoperability testing	X	
35	Analyse the availability of dormant SIM cards and then decide on the actions necessary	X	
37	Study the implementation options available. Utilize the results of HeERO and HeERO2 projects, standards, and literature on the topic.		X
38	Disseminate information on the impacts of eCall. Utilize the materials provided by HeERO, HeERO2, eCall Implementation Platform, iMobility effects database (http://www.imobility-effects-database.org) and iMobility Challenge		X
39	Create and publish a national eCall implementation roadmap or implementation plan		X
40	Increase the awareness of key stakeholders on the implementation options available and the benefits and costs of eCall.		X
41	Identify the organisation which monitors the deployment process and informally or formally takes responsibility for solving problems and keeping the process moving		X
42	Communicate the impacts and implementation options for eCall to the key stakeholders		X
43	Define the roles of the stakeholders in a national eCall roadmap or implementation plan		X
44	Analyse the architectural and deployment options available, utilize the results of HeERO and HeERO2 projects		X
45	Consider centralisation of reception and handling of eCalls to a few key PSAPs – at least as an interim solution		X
46	Temporary arrangements may be used in situations in which all PSAPs are not yet ready to process eCalls (for example, centralised handling of eCalls in a few key PSAPs)		X
47	Define the schedule for deployment and the actions required in a national eCall roadmap or an implementation plan		X
48	Provide training for PSAP staff		X
49	Initiate a MSD retransmission when the first MSD transmission in the beginning of the connection fails.		X
50	Use the voice connection to communicate with vehicle occupants.		X

D6.5 Recommendations on implementation and operation of eCall

51	Support development of certification scheme for eCall IVS and eCall in-band modem components.	X	X
52	Failed MSD transmissions should be taken into account when preparing guidelines for operation of eCall such as when developing call handling and risk assessment procedures for PSAPs.		X
53	Reduce the number of link layer acknowledgements (LL-ACKs) transmitted by the PSAP after a successful MSD transmission.		X
54	Define appropriate call handling procedures for silent eCalls.		X
55	Use the information available via voice connection such as background noise.		X
56	Use the information included in the MSD.		X
57	Validate the location of the caller using network based positioning available for all E112 calls.		X
58	Educate car users on the operation and correct use of eCall with information campaigns.		X
59	If necessary, implement validation of incoming calls before connecting them to a PSAP operator.		X
60	Document the erroneous operation of mobile phone models affected by the problem and contact the equipment manufacturers.		X
61	Support development of certification scheme for eCall IVS and eCall in-band modem components.	X	X
62	Encourage participation in eCall interoperability events.		X
63	Monitor the service quality of E112 emergency calls.	X	X
64	Analyse the status of national regulations concerning the coverage of mobile networks and handling of 112 emergency calls. Implement changes, if necessary.		X
65	The problem can likely be solved with a software update of the mobile network affected by the problem		X
66	Use of training manuals provided by the HeERO project		X
67	Funding of eCall deployment in member states by DG MOVE and the TEN-T programme	X	

Table 5: Solutions to challenges for implementation and operation

5 Recommendations

5.1 Recommendations for member states

The recommendations for member states intending to implement eCall are presented in Table 6.

Recommendation	
Identifier	Description
MS1	Increase the awareness of stakeholders on member state level on impacts, benefits and costs of eCall and the implementation options available. Utilize the results of HeERO and HeERO2 projects, literature available on the subject and other available information sources such as iMobility effects database
MS2	Communicate the impacts and implementation options for eCall to the key stakeholders on member state level
MS3	Organise round table discussions and working groups on eCall on member state level
MS4	Identify a key stakeholder which monitors and possibly also coordinates the overall process towards eCall deployment and formally or informally takes responsibility for solving problems and for the whole process
MS5	Establish a national eCall platform
MS6	Analyse the architectural and deployment options available for eCall. Utilize the results of HeERO and HeERO2 projects, eCall standards and literature available on the topic
MS7	Develop and publish a national eCall implementation roadmap or an implementation plan. The roadmap should describe <ul style="list-style-type: none"> - the actions necessary to achieve a functional eCall service chain - the roles of different stakeholders - the schedule for eCall deployment including the various elements of the deployment process and eCall service chain (especially: eCall discriminator and PSAP upgrades)
MS8	Encourage and facilitate mutual cooperation and technical support between stakeholders within a member state
MS9	Implement the eCall discriminator in mobile networks; cooperate with the mobile network operators and the national telecommunications regulator
MS10	Implement eCall reception and processing capabilities in PSAPs. Use the architectural solutions defined in the national eCall implementation roadmap or implementation plan
MS11	Perform eCall end-to-end tests on member state level to ensure correct functioning and reliable operation of eCall. The tests should cover different mobile network operators, different PSAPs and different geographical areas.
MS12	Perform eCall interoperability tests. Integrate interoperability tests with the end-to-end tests.
MS13	Share and publish the results of the interoperability tests carried out after HeERO and HeERO2 – for example in the context of EeIP or in international conferences.
MS14	Monitor the status of retrofit IVS products and consider actions, if significant challenges or risks are encountered
MS15	Consider centralisation of reception and handling of eCalls to a few key PSAPs as an interim solution if it is difficult to implement eCall reception or processing capabilities in all PSAPs at once.
MS16	Consider the use of specifications defined in EN16102 if TPS-eCall is integrated with PSAPs.
MS17	Analyse the impact of the network echo canceller disabling tone on the reliability of MSD transmission and implement NEC disabling tone in PSAPs, if clear improvement can be observed
MS18	Analyse the reliability of eCall on member state level and the factors contributing to it. Implement necessary changes to the communication networks or to the PSAP (for example, changes to codecs used or transcoding between codecs along the call path from IVS to PSAP)
MS19	Monitor the service quality of E112 emergency calls; analyse the status of national regulations concerning the coverage of the mobile networks and handling of 112 calls, and implement changes if necessary
MS20	Provide training appropriate training for PSAP staff
MS21	Initiate a MSD retransmission when the first MSD transmission in the beginning of the connection fails.
MS22	Use the voice connection to communicate with vehicle occupants if the MSD transmission in the beginning of the connection fails.
MS23	Support development of certification scheme for eCall IVS and eCall in-band modem components.

Recommendation	
MS24	eCall MSD transmission is not always successful. Take this into account when preparing national guidelines for operation of eCall (for example, guidelines for call handling or risk assessment in PSAPs)
MS25	Reduce the number of link layer acknowledgements (LL-ACKs) transmitted by the PSAP after a successful MSD transmission or omit transmission of LL-ACK completely to reduce voice channel blocking time.
MS26	Take silent calls into account when developing national guidelines for operation of eCall (for example, guidelines for call handling and risk assessment)
MS27	Use the information available via voice connection such as background noise in case no one in the vehicle is able to talk.
MS28	Use the information included in the MSD in handling of silent calls and calls in languages not understood by the PSAP.
MS29	Validate the location of the caller using network based positioning available for all E112 calls. Use network based positioning in case where the position included in MSD cannot be trusted.
MS30	Educate car users on the operation and correct use of eCall with information campaigns.
MS31	If necessary, implement validation of incoming calls before connecting them to a PSAP operator.
MS32	Document the erroneous operation of mobile phone models affected by the problem and contact the equipment manufacturers.
MS33	Ensure that mobile networks support E.164 numbers with the length up to 15 digits as defined in GSM and 3G specifications. The problem can likely be solved with a software update of the mobile network affected by the problem.
MS34	Encourage participation in eCall interoperability events.
MS35	Participate in international cooperation in the context of EeIP to exchange information and best practises and to contribute to further development of eCall
MS36	Define appropriate call handling procedures for automatic and manual eCalls (for example, handling of silent calls and calls in languages other than the official languages of the member state)
MS37	Use HeERO training manuals when providing training to PSAP operators

Table 6: Recommendations for member states

5.2 Recommendations for European Commission

Recommendations intended for European Commission are presented in Table 7.

Recommendation	
Identifier	Description
EC1	Complete European level regulation which mandates the implementation of eCall in PSAPs, communication networks and new type-approved vehicle models
EC2	Monitor the status of retrofit and OEM IVS products and consider regulatory actions if significant risks or challenges are encountered
EC3	Support the development of certification scheme for eCall IVS and in-band modem components (this work is currently being carried out in HeERO2)
EC4	Consider the need for development guidelines for retrofit IVS products; support the development of guidelines for example by European eCall implementation platform (EeIP)
EC5	Initiate and support further research and related road-mapping work on the long-term evolution of eCall including analysis of options available to manage the lifecycles of vehicles and wireless communication networks
EC6	Facilitate the cooperation of eCall stakeholders and further development of eCall specifications (such as specifications for PTI) in the context of EeIP
EC7	Continue support to standardisation and further research on eCall taking into account <ul style="list-style-type: none"> - the work carried out by ETSI STF 456 and IETF working group ECRIT on the future development of eCall - the need to optimise the acknowledgement mechanism of eCall MSD transmission to reduce voice channel blocking time - the need to ensure reliable operation of eCall such as the reliable operation of MSD transmission (including retransmission, analysis of the correlation between outcomes of successive MSD transmissions during the same call is recommended) - needs for recommendations on the service quality acceptable for eCall (such as the acceptable MSD success rate)
EC8	Support dissemination of information on eCall (examples of current activities performing eCall

D6.5 Recommendations on implementation and operation of eCall

Recommendation	
	dissemination: iMobility Challenge, HeERO, iMobility Support and EeIP)
EC9	Support dissemination of information on impacts of eCall (examples of current activities performing eCall dissemination: iMobility Challenge, HeERO, iMobility Support and EeIP)
EC10	Continue monitoring the deployment of eCall as a part of monitoring related to the European ITS directive
EC11	Encourage sharing and publication of the results of eCall interoperability tests to be carried out after HeERO and HeERO2 projects, for example in the context of EeIP or international conferences
EC12	Analyse the availability and regulatory status of dormant SIM cards and decide on actions necessary
EC13	Support the member states in their efforts to communicate the functionality and correct use of eCall to citizens – for example by providing information material
EC14	When supporting national eCall pilots, encourage participation in eCall interoperability events
EC15	Consider the need to provide guidelines for automatic and manual triggering of eCall
EC16	Funding of eCall deployment in member states by DG MOVE and the TEN-T programme (note: the funding scheme has to be aligned with the needs of member states)

Table 7: Recommendations for European Commission

5.3 Recommendations for standardization organisations

Recommendations for standardization organisations are presented in Table 8.

Recommendation	
Identifier	Description
SDO1	Include references to CEN standards in the ETSI/3GPP standards when necessary. For example, <ul style="list-style-type: none"> - include clear references to timers mentioned in Annex A of EN16062 in ETSI TS 126 267
SDO2	Provide specifications for support of eCall functionalities in 4G (LTE) networks taking into account the work carried out by ETSI STF 456 and IETF working group ECRIT
SDO3	Provide a long-term roadmap for the evolution of eCall taking into account the lifecycles of vehicles and wireless communication technologies and including the means available to maintain the compatibility of IVS with wireless networks and PSAPs over extended period of time
SDO4	Develop CEN TS 16454 into European standard
SDO5	Monitor the work being carried out on periodic technical inspection of eCall IVS and implement changes to standards if necessary; participate in the work of EeIP task force PTI if necessary
SDO6	Continue support for organising eCall interoperability events
SDO7	Clarify the role and use of the LL-ACK in CEN and ETSI standards: <ul style="list-style-type: none"> - provide guidelines on the numbers of LL-ACKs and HL-ACK - the fact that LL-ACK is not mandatory should be made clear to developers of IVSs and PSAPs
SDO8	Update the annex A of EN15722:2011 or add an errata to the standard (some values in the example presented in Annex A are not possible according to the ASN.1 specification presented in the standard)

Table 8: Recommendations for standards development organisations

5.4 Recommendations for other stakeholders

Recommendations for other stakeholders than member states, European Commission or standardization organisations are presented in Table 9.

Recommendation		Notes
Identifier	Description	
DEV1	Continue organising eCall interoperability events	ERTICO, industry or SDO
DEV2	Use dead-reckoning to support GNSS in determining the position of the vehicle. This is expected to improve IVS performance in case of short periods	IVS manufacturers

Recommendation	Notes
of unavailability of satellite signal (such as tunnels).	

Table 9: Recommendations for other stakeholders

5.5 Mapping between recommendations and challenges for implementation and operation

The mapping between recommendations (tables 6-9) and challenges for eCall implementation and operation is presented in tables 10 and 11.

	MS1	MS2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13	MS14	MS15	MS16	MS17	MS18	MS19	MS20	MS21	MS22	MS23	MS24	MS25	MS26	MS27	MS28	MS29	MS30	MS31	MS32	MS33	MS34	MS35	MS36	MS37		
1.1																																							
1.2																																							
1.3																																							
1.4																																							
1.5																																							
2.1																																							
2.2																																							
2.3																																							
2.4																																							
2.5																																							
2.6																																							
2.7																																							
2.9																																							
2.10																																							
2.11																																							
2.12																																							
2.13																																							
2.14																																							
2.15																																							
3.1																																							
3.2																																							
3.3																																							
3.4																																							
3.6																																							
3.7																																							
3.8																																							
4.2																																							
4.3																																							
4.5																																							
4.6																																							
4.7																																							
4.8																																							
4.9																																							
4.10																																							
4.11																																							
4.12																																							
4.13																																							
4.14																																							
4.15																																							
4.16																																							
4.17																																							
4.18																																							
4.19																																							
5.1																																							
5.2																																							
5.3																																							

Table 10: Mapping of recommendations to challenges, part 1

D6.5 Recommendations on implementation and operation of eCall

	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EC10	EC11	EC12	EC13	EC14	EC15	EC16	SDO1	SDO2	SDO3	SDO4	SDO5	SDO6	SDO7	SDO8	DEV1	DEV2	
1.1																											
1.2																											
1.3																											
1.4																											
1.5																											
2.1																											
2.2																											
2.3																											
2.4																											
2.5																											
2.6																											
2.7																											
2.9																											
2.10																											
2.11																											
2.12																											
2.13																											
2.14																											
2.15																											
3.1																											
3.2																											
3.3																											
3.4																											
3.6																											
3.7																											
3.8																											
4.2																											
4.3																											
4.5																											
4.6																											
4.7																											
4.8																											
4.9																											
4.10																											
4.11																											
4.12																											
4.13																											
4.14																											
4.15																											
4.16																											
4.17																											
4.18																											
4.19																											
5.1																											
5.2																											
5.3																											

Table 11: Mapping of recommendations to challenges, part 2

6 Concluding remarks

This document has provided recommendations for the implementation and operation of eCall based on the challenges and enablers identified in D6.2 and D6.4 of HeERO. In addition, the recommendations are supported with an analysis of the challenges for implementation and operation of eCall.

The results of the analysis of the challenges suggest that two of the most significant challenges for eCall implementation are related to administrative and business issues (challenges in gathering full support from all stakeholders due to lack of legislative framework or legally binding decision to implement eCall on member state level and difficulties in assigning responsibility for eCall in a complex administrative situation) and to technical issues (weaknesses of IVS implementations and the fact that MSD transmission is not always successful). The recommendations addressing these four challenges are especially important when planning actions to support the deployment of eCall as a new ITS service.

An initial check for the completeness of recommendations was performed by checking that there is at least one recommendation in Tables in 6-9 addressing each of the challenges listed in Table 4. However, the list of recommendations is non-exhaustive. It is possible that more recommendations could have been identified in additional discussions with stakeholders working with eCall.

7 References

Öörni, R. and Brizzolara, D. 2014. D6.2 eCall Deployment enablers and opportunities and challenges: final report. HeERO deliverable D6.2, unpublished draft version v0.70.

Öörni, R., Vilkmán, A., Dumitrescu, D., Pritvic, P., Lumbreras, C., Grzebellus, M., Thom, J., Coldeway, B. J., Roine, M., Brizzolara, D. and Zulkarnain, Z. 2014. Implementation roadmap and guidelines for eCall deployment in Europe. HeERO deliverable D6.4, unpublished draft version 0.70.