PROJECT NO.
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PROJECT ACRONYM
EMDM

PROJECT TITLE
EUROPEAN MARITIME DATA MANAGEMENT

SIXTH FRAMEWORK PROGRAMME
THEMATIC PRIORITY 6: SUSTAINABLE DEVELOPMENT, GLOBAL CHANGE AND ECOSYSTEMS
FUNDING SCHEME: SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECT
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FINAL ACTIVITY REPORT

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EXECUTIVE SUMMARY

The EMDM project aims to study and develop new applications, functionalities and proposals for specifications and standards for enhanced, interactive VDRs and electronic logbooks, in order to face to the challenge of the intermodal, safe and secure European transport development.

The consortium is composed of 8 partners including the three main European VDR and electronic logbook manufacturers. These partners are:

- SODENA SAS, a French company offering a large range of functions and services required to run a ship.
- Consilium Navigation, a Swedish/Italian manufacturer of navigational equipment experienced in integration of complex bridge systems and in developing advanced modules like VDR.
- Kongsberg Maritime, a Norwegian company providing marine electronics.
- Kelvin Hughes, a world leader in the design and manufacturing of marine navigation systems for the commercial and defence market.
- The University of Southampton, specialised in research and engineering in the maritime area.
- Avenca, an independent consultancy specialised in the analysis of data from machinery monitoring systems.
- Euroquality, a French consulting company specialised in the setting up and management of European projects.
- And the European Commission, represented by the Joint Research Centre, whose mission is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies.

The EMDM project, whose duration is two years (from March 1st, 2007) with an overall budget of 2.795.368 Euro, will lead to a better and more objective analysis of the causes of incidents and accidents in European waters and subsequently to the improvement of maritime safety. This will be done through studies of the needs of the maritime community, discussion of a high level group of stakeholders, including most of the member states and equipment manufacturers, conducing to the deliveries of draft standards on VDRs and Electronic logbook (WP1 and WP2).

Specific studies on potential use of electronic logbooks, assessment of VDRs application for automatic control, development of new concept obtained from exploitation of the registered VDRs data, are being realised in WP3.

Research focuses on the development of low acquisition and exploitation cost VDRs and specific interfaces for retrofitting VDRs on existing ships (WP4). New VDRs functionalities are being developed with interactive links to existing systems such as the electronic logbook, the AIS or other security devices. Structural stress monitoring, coupling of VDRs to the electronic logbooks, the integration of other electronic navigational systems are among the functionalities addressed by the project (WP5).
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http://www.euroqualityfiles.net/emdm
PUBLISHABLE SUMMARY

Maritime transport security
A European research project provides draft amendments to existing VDR standards

It is over a decade since International Maritime Organisation (IMO) adopted the Voyage Data Recorder (VDR) performance standard which was formulated to be deliverable by and compatible with the technology available at the time. Technological advances over the last 10 years mean that VDR could and should now be required to deliver more for the investment involved.

In order to investigate just what might be required and achievable, the European Maritime Data Management (EMDM) project set up in March 2007 with €2.8 million budget. Its aim is to study and develop new applications, functionalities and proposals for specifications and standards for enhanced, interactive VDRs and electronic logbooks (ELBs).

EMDM project co-ordinator is the French company SODENA, specialised in on board navigation software such as ECDIS and RADAR, supported by Euroquality for the administrative and financial management of the project.

The consortium is composed of 8 partners including the three main European VDR and electronic logbook manufacturers: Consilium Navigation (SW), Kelvin Hughes (UK) and Kongsberg Maritime (NW), three SMEs: Avenca (UK), Euroquality (FR), SODENA (FR), the Joint Research Centre of the European Commission (JRC) and the University of Southampton (UK).

One intention, when the two-year project concludes in February 2009, is that it will deliver better and more objective analysis of the causes of incidents and accidents in European waters and subsequently lead to the improvement of maritime safety. The project has already placed much of its investigative work in the public domain at: www.euroqualityfiles.net/emdm/index.php.

Reports have been produced on (S)VDR legislation, VDR data technical access and handling, survey results and draft amendments for existing VDR standard, specifications for Low Cost VDR adapted for work boat have been write and prototype tried on board Fishing vessel in Brittany. These reports provide a useful retrospective view of VDR up to the inception of EMDM, and insight into how VDR could meet the challenge of the modern maritime environment. Equipment can take advantage of factors such as lower cost, higher density data storage capacity, increased processing power and the change of technology architectures based upon simple, robust, standardised communication networks that distribute data locally and globally.

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EMDM public domain: http://www.euroqualityfiles.net/emdm
SECTION 1 – OVERVIEW OF GENERAL PROJECT OBJECTIVES, PROJECT’S CURRENT RELATION TO THE STATE-OF-THE-ART

General problems to be solved

Because of the increase in the volume of maritime transport, there are still nowadays a lot of accidents involving vessels, of which some are even causing losses of life among members of the crews. To face this issue and to increase security on the sea, the International Maritime Organisation (IMO) has agreed on specifications and a timetable for the carriage of Voyage Data Recorder (VDR) and S-VDR (Simplified VDR) on board of existing and new ships, similar to black boxes that are used on aircraft.

This regulation only affects large ships for the moment, and will soon require every shipping company to equip their fleet with VDR. To ensure a wide acceptance of this equipment and to improve the exploitation of the data by Accident Investigation Bureaux or for Fleet Management purposes, there is a need to reduce their costs and to improve the general performances and specifications of VDRs.

Moreover, a serious lack of standardisation for the collecting, recording, storing and reading of the data stored has been discovered at the light of experience. The same lack of standardisation also affects the Electronic Logbook, whose features are of a great interest for the reporting and the safe management of ships.

Proposed solutions

To fulfil these needs to answer these problems, the EMDM consortium is focusing on the general improvement of VDRs and Electronics Logbooks regarding their functionalities and specifications, and on the means of improving safety on the sea thanks to these technologies. This will be achieved through the following research and development activities:

• Improvement of standards and specifications for VDRs and for Electronic Logbook,
• Retrofitting of VDRs on existing ships of all sizes,
• Studies of new applications and development of new functionalities for VDRs,
• Development concepts and procedures for the routine use of the information obtained in safely operating vessels and managing shipping,
• Identification and Assessment of possible new applications for Electronic Logbook.

Scientific and technical objectives

To achieve the development of the proposed solutions, Studies and R&D activities must be carried out on:

• Standardisation draft for VDR on recording and storing of data and on the access to the data,
• Standardisation draft for Electronic Logbook,
• A software for routine analysis of VDR data
• A low-cost VDR
• S-VDR interfaces with other electronic devices on board, notably with the ECDIS system,
• Enhanced Electronic Logbook Features using VDR data,
• A functionality for VDR which will lead to a reduction in on-board cabling and installation requirements,
Proposal for future applications of Electronic Logbook and VDR,
Advanced Knowledge for ship safety, crew training and ship manoeuvring.

Demonstration and Testing activities must be also carried out on:
- The retrofitting of VDR on existing ships with different equipment
- The installation of an integrated ECDIS/VDR Prototype
- The Advanced Logbook

SECTION 2 – WORKPACKAGE PROGRESS OF THE PERIOD

2.1 Workpackage 1: Improvement of standards for VDRs

Workpackage objectives and starting point of work at beginning of reporting period

The aim of WP1, which is being led by the University of Southampton, supported by Kelvin Hughes expert, Chris Winkley IEC/CIRM VDR specialist, is to produce revisions and annexes to existing IMO/IEC standards for VDR based on the findings of their research. The existing standards have to be widened to include the specification for a low-cost VDR and to take into account feedback received by the external liaison group on experiences and lessons learnt from incident analyses when using VDR.

The submission of these changes to international standards has to be introduced using, wherever possible, those frameworks and procedures already in existence and known by the WP expert. The standard drafts have to be completed within 18 months and to be assessed by the Expert Working Group before formal submission, via the established channels, to the relevant Bodies.

Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved

Task T1.1: Review of VDR legislation

The technological requirements of sea-going vessels are affected by the vagaries of maritime law together with the need to improve the standard of safety at sea and to reduce maritime pollution. In order for WP1 to achieve a satisfactory result, the first task was to conduct a thorough and complete review of the existing situation relating to VDR and SVDR legislation. This task was successfully achieved. The aim of D1 “Report on existing VDR and SVDR legislation”, produced by the University of Southampton, was to identify any legal regulations which might influence the choice of ship science technologies, such as Voyage Data Recorders (VDRs).

International maritime regulations are drawn up by the International Maritime Organisation (IMO) usually in the form of performance standards. These are developed into technical and test standards by the International Electro-technical Commission (IEC). Other organizations such as The International Association for Marine Electronics Companies (CIRM) have played a role in VDRs and also has a consultative status at the IMO.

A VDR is defined in a Marine Navigators Glossary as “a system that may be in the form of several separated but interconnected units, intended to maintain, in a secure and retrievable form, information concerning the position, movement, physical status, command and control
of a vessel over a period leading up to, and following an incident”. It is sometimes also referred to as a Marine Black Box.

The current legislation concerning VDRs is embodied in SOLAS Chapter V under Regulations 18, 20 and Annex 10. In summary, the existing rules for the carriage of VDRs cover all new vessels (over 3000gt) engaged on international voyages with a phased retrofit on all existing vessels (over 3000gt) by 2010.

The final objective of this study was to recognise and identify the national routes available to gain access to the IMO and to enable the submission of papers. Presently, the UK’s national route for submitting papers to the IMO is via the Maritime and Coastguard Agency (MCA) – Formerly the UK Department of Transport Marine Directorate.

This research addresses many important issues associated with the implementation of VDRs across the majority of the shipping fleet. It also highlights some background information leading to the introduction of VDRs and the important role of VDRs in respect of legislation and to the maritime community at large.

The objectives of Work Package 1 on the EMDM project include the research, development and production of revisions to existing Voyage Data Recorder standards; and to extend the existing standards to cover simplification of access and availability of data. The report D2 on Data Access and Handling, produced by Avenca, highlights the following conclusions and recommendations, that should help to have a clear picture on the level of harmonization between VDR manufacturers and the report will be the base for T1.3, T1.4 and T2.4 for the normalisation, and T4.1 for the interfaces of VDR with other equipment:

• The current IMO and IEC specifications detail several requirements relating to the storage and download of data from VDRs. However they do not specify the mechanisms to be used.
• Current Type Approved VDR systems use several different storage and download mechanisms with Flash memory the most commonly used storage mechanism in currently available VDRs. As the price of Flash memory decreases, it is expected that the presence of Flash memory in the VDR market will continue to grow.
• All the current VDR systems which were surveyed provided a facility to download data directly to a PC using a cable connection. Ethernet is by far the preferred method of connecting VDRs to external PCs/Laptops. This is not expected to change in the foreseeable future.
• The current performance standards do not specify any specific file formats for radar, audio or NMEA data while the data is stored internally, but recent amendments to the specifications do specify that it must be possible to export the data to an open format.
• The vast majority of VDR data is made up of audio and radar data. In comparison, sensor (NMEA) data takes up a very small amount of space (~3%) and could take up even less space if compressed (0.5%).
• Remote VDR data transmission would bring several benefits such as an extra level of offsite backup. Automating this service would allow it to be transparently integrated into systems without affecting current operations. If data is transmitted in real time, this would also provide an almost instant copy of the VDR data in the event of a disaster without having to retrieve the ship’s protective capsule.
• It is likely that most vessels which already possess a satellite communication. It is likely that most vessels which already possess a satellite communication service have sufficient bandwidth to transmit NMEA sensor data on its own to shore in real time. To achieve real
time transmission of audio and radar data as well would require one of the latest services with at least 284 Kbit/s download speed.

- Ships on short voyages could make use of WiFi in port to routinely download data. This would prove to be much more cost-effective compared to a satellite service. As internal storage space of VDRs increase, this becomes more feasible solution for longer haul voyages.
- It is recommended that in any future new VDR specification, consideration is given to specifying the format to be used for storing data and the mechanisms for downloading data. This would enable a more standard download/analysis procedure across all VDRs manufactured to that specification, and make it easier for accident investigators to analyze the data.
- It is recommended that a remote VDR data backup procedure is trialed. A feasibility study would help establish the viability of the technique. The study should encompass trialing long haul voyages (backups via satellite communications using a VPN) as well as short haul voyages (backups via in port WiFi encrypted and authenticated by WPA).
- The significant ongoing reductions in the cost of memory, and the increasingly widespread availability of digital outputs from marine electronics mean that consideration should be given to the feasibility of developing a very simple, low-cost VDR which could be used upon smaller vessels, such as fishing boats and recreational pleasure craft.

Development, manufacture and testing costs of such a product should be significantly reduced by the following strategies:

* Removal of the requirement to store radar or audio data would significantly reduce storage requirements (in addition to considerably simplifying the data acquisition and installation aspects of the system). A current-generation VDR system typically requires a 2GB protective capsule to store 12hrs of the full IMO-specified dataset. However, if only sensor (NMEA) data was required, only around 100 to 200MB of storage would be required for 12 hours of data. Alternatively 2GB memory would enable more than 18 days of NMEA data to be stored, or if the NMEA data is compressed, this could increase to ~120 days worth of data.
* Reduced requirements for the protective capsule (in terms of fire protection and/or penetration) would also have a significant impact on overall system costs.
* It is recommended that VDR manufacturers are encouraged to make use of any large capacity media available in their VDRs to store more data than the required 12 hours as standard. This maximizes the chances of data being available following an incident, should action not have been taken to preserve it from being overwritten within 12 hours of the start of the incident.

**Task T1.2 : Survey to improve existing standards and specifications for VDRs**

This task T1.2 has been done in collaboration between UoS and EQY. It consisted in the survey of the maritime community on the subject of VDR and S-VDR to seek views on possible improvement and to learn of their experiences, so that the results of the survey can show ways of improvement of standards and specifications.

UoS, supported by the expert group (that met for the first time on July 11th in Paris and a second one on December 11, 2007 in London) elaborated questionnaires to identify the needs of end-users for improvement of VDRs. Four different versions of questionnaires were produced, related to four different kinds of targeted organisations: ship owners, lawyers, institutions (European offices in charge of the investigations on the maritime accidents, safety
organisations etc.) and equipment suppliers. EQY developed an online version of the questionnaires, connected to a database, and published on the project website. The aim was to allow during the second phase of the survey, a faster treatment of the results and the possibility for statistics to be drawn. The survey was disseminated to a large list of people (500 e-mail addresses), elaborated by all the partners extended to the expert group. The main maritime actors in the World were surveyed. This list was enlarged for a second less targeted dissemination to 4677 contacts acting in the maritime sector eventually concerned by the survey objectives. Finally, 54 people answered, mainly institutions at 55%. Whilst the number of responses was low a sufficient number were received to permit some meaningful analysis by UoS. The analysis is reported in the deliverables D3 Report on survey result (VDR). The final versions of both reports were delivered on time. The breakdown of the survey responses is in the reports and also available on the website.

**Task T1.3 : External liaison group**

An external Liaison Group has been set up at the outset of the project. The main purpose of the Group is to canvass support throughout the exercise to ensure that a collective and cohesive submission of draft(s) is made to the IMO following completion of the project. It is led by an Industry Expert within the consortium: Mr Chris Winkley from Kelvin Hughes.

The team is finally constituted of:
- Chris Winkley: Group leader
- Mike Travis: Accident investigator
- Allan Gravesson: Maritime union affairs
- Jens Affeld: Accident investigator – Project officer
- David Taylor: Maritime insurance and underwriting
- Nils Engstrom: VDR specialist
- Gwynne Lewis: Naval architect
- Gaute Gjelsten: Lawyer – maritime affairs
- Gylfi Geirsson: VMS & fisheries control specialist
- Patrick Rondeau: Shipowner representative

The Group first met on July 11th and December 11th 2007 to exchange information. EQY developed a web forum accessible from the private area to facilitate communication between the experts.

**Task T1.4 : Writing of standards**

Based on the work accomplished during the Workshops at T1.3 and on the results of T1.1 and T1.2, UoS prepared a draft version of the D6 deliverable about draft amendments to the existing VDR standards for the Workshop 2 meeting as agreed at the Milestone 3 meeting. The draft was updated following discussion at that meeting and delivered by the end of January 2008.

During this period the IMO agreed that the existing Performance Standard for VDRs, (dated 1997), should be reviewed through 2008. This development was brought to the attention of the EMDM Project Team and the EU advised. As a result some adjustments were recommended to the original timetable at the working group meeting (between UoS, KH,
SODENA and EQY) on 16th of January 2008 and at the 12-month meeting in Ispra, Italy on March 7th 2008.

In the interim, discussions and meetings have been held by the KH representative with M.A.I.B., C.I.R.M. and UK MCA. These links will be maintained in the run-up to the IMO NAV sub-committee meeting(s) when the various VDR input papers will be debated.

The EMDM consortium decided to produce a version of the Deliverable D6 in advance to meet IMO deadlines. This latest version was send to the EC on March 14, 2008.

**Deviations from the project workprogramme, and corrective actions taken/suggested**

There was an unexpected delay in the achievement of the survey, because of the very low answer rate. The scope of people targeted was thus enlarged to increase the number of responses and allow a statistic analysis.

The consortium agreed to change the dissemination level of D6 from PP (programme participants only) to PU (Public) to support the activities in WP.1- T1.4b for submission to IMO. This required an amendment to the contract by changing the Technical Annex content. The main modifications are:

1 - To avoid confusion (and because of the future change in regulations in 2010), the EMDM consortium decides to give up the use of term “SVDR”, and replace it by “VDR” ; “low-cost VDR” will replace “low-cost SVDR”. This implies new changes in Annex I, and particularly in the names of deliverables. For example,
- D6 becomes “Draft amendments for existing VDR standards”.
- D7 becomes “Draft standards for low cost VDR”.
- D16 and D17 are merging to become an unique deliverable.
- D18 becomes “Prototype of interface VDR / other device ».
- D19 Prototype of a low cost VDR.
- D31 becomes “Guide for low cost VDR retrofitting”.

2 - To allow a coherent advancement of the project the EMDM consortium agree to modify some deliverables deadlines (as agreed during the last meeting in Southampton in October 2007).
- As the survey answer rate was very low, the EMDM consortium decided to extend the duration of the survey and to increase the number of organisations to which the EMDM questionnaire was sent. The deliverables D3 (“Report on survey result - VDR”) and D9 (“Report on survey results - ELB”) were delayed from T0+6 to T0+10.
- According to the real work programme, the EMDM consortium agrees that the deliverables D7 (“Draft standards for "low cost VDR") was advanced from T0+18 to T0+12 whereas the deliverables D15 (“Specification for European small craft VDR”) was postponed from T0+6 to T0+12.
- The Expert workshops started a bit later than initially foreseen and the Report on Workshop 1 (D4) and 2 (D5) were postponed from T0+3 and 6 to T0+10.

3 – To take part in the review process of the existing IMO Performance Standard for VDR the
EMDM consortium decides to modification the diffusion level for the D6 and D7 (PU). All other provisions of the contract and its annexes remain unchanged.

2.2 Workpackage 2: Improvement of standards for electronic logbooks

Workpackage objectives and starting point of work at beginning of reporting period

The aim of WP2, which is led by the University of Southampton is to release two drafts for the improvement of the current standards of Electronic Logbooks. The goal of the WP2 is to accelerate the process of standardisation by providing the IMO experts, of whom some are part of the project Expert Working Group, with standard drafts, on the one hand specifying the recording and storing the data, and on the other hand specifying a simplified access to the data stored by Electronic Logbooks. The standard drafts will be delivered within 18 months and will be assessed by the Expert Working Group before their submission to the IMO.

Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved

Task 2.1 Review of electronic logbook legislation

This task was successfully achieved. Deliverable D8 “Report on existing Electronic Logbook legislation” was produced by UoS.

It includes:
• A description of the different types of electronic logbooks (Deck logbook, K-LOG, Dynamic positioning logbook, Engine logbook, Oil record book, Operational logbook, Radio logbook), and their functions.
• A list of benefits of electronic logbooks: the recording of information, a higher quality data, the reduction of Man power and cost for employers, and the possibility to integrate information with other systems.
• A comment on the workings and activities of the IMO with the respect to legislative matters for electronic logbooks (this part includes an outline of MSC/CIRC.982 with regards to electronic logbooks, guidelines on resolution MSC.86 (70), adoption of new and amended performance standards for navigational equipment, a comment on Regulation 15 of SOLAS chapter V and electronic logbooks, and guidelines on regulation 17).
• A comment on the workings and activities of the IEC with the respect to legislative matters for electronic logbooks.
• A description of the work of the European Union with regards to electronic logbooks
• Regulation 28 of SOLAS chapter V.

T2.2 Survey to improve existing standards and specifications for Electronic Logbook

This survey is described in the task 1.2. UoS reported its results regarding the E-Logbook in the deliverables D9 Report on survey result (ELB).

T2.3 Workshop in common with WP1 and WP2

The external group described in the task 1.3 is working on both WP1 and WP2.
T2.4 Writing of standards for Electronic Logbooks

As agreed at the Milestone 3 meeting, a draft deliverable was produced for the Workshop 2 meeting in December. Following discussion this was updated and a new draft of the D10 “Draft standard for Electronic Logbook” was delivered in February 2008.

Deviations from the project work programme, and corrective actions taken/suggested

No deviations or corrective actions to be reported.

2.3 Workpackage 3: Studies on VDRs and Electronic logbooks

Workpackage objectives and starting point of work at beginning of reporting period

The aim of this Work Package, led by Avenca, is the study of VDR and Electronic Logbooks, in order to examine the possibility of using either the Devices or the data stored in the Devices in new applications or functionalities, with the purpose of the improvement of Safety on the sea, of the ease of use to ensure Safe operations and of the Control by Authorities.

Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved

Task T3.1: Development of procedures for the routine use of information

• Task T3.1.1 - Development of concepts and procedures for the routine use of information. During this task, the novel concepts which have already been developed by Avenca for the routine automated analysis of VDR data were initially reviewed with a number of different shipping operators, chosen to represent different types of vessel operation (e.g. Ferries, Cruise Liners, Tankers etc). For each operator, the VDR being used was considered, and consideration given to data availability, transfer mechanisms, the rules that might be applied to the data, mechanisms and procedures for communicating the results to ships’ crew. By the end of this task, two operators had been found who were willing to cooperate with the research programme: one operator of Cruise Liners, the other an operator of Tankers.

• T3.1.2 – Definition of a suitable investigation approach. During this subtask there were further discussions with the two operators (cruise ship and tanker) which were previously selected. We elected to analyze data from 2 cruise ships (which are fairly similar to each other), and a class of around 8 tankers. Some initial rules to apply to the data were defined through discussion with both the operators, and Avenca’s existing software was configured to suitably process the data from these ships. This phase is now completed.

• T3.1.3 – Investigation of the practicalities of the approach. The analysis system has been commissioned for the two types of ship. A number of downloads were successfully processed from the cruise ships, and the results reviewed with the operator. (This was in advance of the originally planned timescales, as the ships are currently away from UK waters for about 3 months, so consequently no new data is available from the cruise ships until April). One test dataset has been downloaded from a tanker, and
the results have been reviewed with the operator. Download media have now been sent to all the tankers in the class to be studied, and we are currently awaiting more data.

Work has continued with the receipt and analysis of further data from the cruise ships, further refinement of the processing, and the mechanisms for presenting information to the users. The final analysis of all the data received was completed during M22-M24.

Task T3.2 : Assessing additional fields of applications of VDR
This work item was primarily performed by UOS, and although no deliverable was required, a report has been produced has now been reviewed. This task is now completed.

Task T3.3 : Assessing additional functionalities of electronic logbooks
Task T3.4 : Identification of possible new applications for electronic logbooks
These work items were primarily performed by JRC. Deliverables D13 and D14 have been completed as required. These tasks have now been completed.

Task T3.4 : Identification of possible new applications for electronic logbooks
Given the strong partnership of EMDM in terms of on board software developers, a number of electronic logbook packages were available to project. The whole range of vessels was covered from fishing vessels to cargo vessels and tankers. JRC's role was to think in advance on how the captured electronic logbook data can be used for:
  a) improving safety and security on board,
  b) simplification of on board procedures,
  c) provision of training and simulation and even,
  d) new business cases and financial gain.

The report D12 concludes that the electronic logbook opens a complete new horizon in dealing with its data. Shipping companies could use them for new business cases along to the simplification of their normal shipping operations.

There are currently a number of applications for the electronic logbook, such as deck logbook, noon logbook, engine logbook, pump logbook, radio logbook. JRC analyzed the most important work streams on vessels that would need to be documented on a logbook. This includes berthing/ piloting as such work streams that need to be documented in form of electronic logbooks, in which capture of data through sensors would be beneficial. Furthermore commercial vessels could be used for completely automated environmental monitoring and reporting.

Deviations from the project workprogramme, and corrective actions taken/suggested
A second set of data had been requested from the tanker fleet being studied but that data had not been received by the end of November which was the original end date for T3.1.3.

2.4 Workpackage 4 : Retrofitting of S-VDRs on existing ships

Workpackage objectives and starting point of work at beginning of reporting period
To follow the current and forthcoming regulations, shipping companies of all kinds have or will have in a near future to equip their vessels with a Voyage Data Recorder. On some ships,
the existing equipment of data collection can be the ECDIS, which is widely used, and different on others. In order to retrofit the VDR on all existing ships, including inland navigation crafts such as inland barge, the consortium has split the development of interfaces in two groups: interfaces with ECDIS and interfaces with others sensors and data collection equipment. This way, the interfaces developed will allow the VDR to be fitted on any ship and will not depend on the existing equipment. Furthermore, aware of the high price of actual VDR, the consortium will develop a lower-cost VDR that can be affordable even by the smallest companies.

The Consortium will develop interfaces for VDR and for ECDIS in the same task T4.1 as the interfaces with VDR are extensions.

**Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved**

**T4.1 Development of an interface between the VDR and the ECDIS**

The development of the deliverables was drafted by SODENA and CSLM. The specification is based on a modular platform solution that can be individually configured depending on vessel type and the required standards. The study is about reaching a strong integration between VDR and ECDIS on non SOLAS vessels through better economic layout, and offer the possibility of integrating a logbook. This economic point of view lead the two partners to develop a system integrating both functionalities: Back up ECDIS and VDR. The savings realized made this trade proposal attractive on three levels:
- material costs: a unique calculator for both functions
- installation costs: sensors connexions do not have to be duplicated
- maintenance costs: data acquisition controls are common

Moreover ECDIS backup benefit from a spare battery and the protection of power supply.

EMDM project concerns the integration of SODENA’s ECDIS software on the calculation platform used by Consilium’s VDR. The purpose was to merge calculator, resources and also data acquisitions. Benefits from their proposal can be spread to additional provisions for other EMDM project partners, for instance the recording of the logbook on the VDR capsule.

The objective of decreasing acquisition costs has been reached: the difference between the cost of two separated systems and the cost of a unique system offering two provisions (VDR and ECDIS) leads to a 20% saving. Besides, the installation cost of ECDIS is also diminished because this solution saves 70% of installation time.

**T4.3 Development of a lower-cost S-VDR**

**Video Module for Low Cost VDR**

Development, prototype manufacturing and verification of soft ware and hard ware for a low cost radar grabber unit that captures video channels from Radar/Conning/ECDIS etc. The unit has an Ethernet port used for transmission of video data and configuration. The development includes hardware development of a dedicated video interface board and a DSP- FPGA board. The development also includes special advanced compression software of the captured images and transmission of the images remote client. Windows based tools for setup and configuration of the unit has also been developed.
Audio Module for Low Cost VDR
Development of a low cost audio mixer unit that includes hardware and software development of a specific audio interface board with independent audio input channels. The module has an Ethernet port used for transmission of audio data and flexible and cost-effective configuration. The first hardware prototypes of the audio interface board have been produced. Software development of an efficient audio compression algorithm has been ongoing since second quarter. Software development of an embedded real-time audio recorder and mixer application is on going.

NMEA Module
Development of a standalone NMEA module. The module has an Ethernet port used for transmission of the NMEA data and configuration.

Central Module
Development of a LC VDR “central” module that receives the video, audio and NMEA data over Ethernet and sends the data to the LC VDR Media / Capsule (FRM). Development of a Software package that supervise the input modules and the capsule. Development of software for backup and maintenance of the VDR system.

T4.4 Demonstration of VDR retrofitting
SODENA and Consilium installed their prototypes of retrofitted low cost VDR on board of two fishing vessels in December/January 2008. It tested the software stability, the recording stability, the relevance of measures on the vessel (success rate of 80%), and the relevance of sea measures. It explained the difficulties it faced to record beginning and end of fishing operation and also reported about the feedback from end user, ship-owner, distributors, insurance and association in charge of vessel security. The demonstration enabled to check the acceptability of the product by fishermen: acquisition, installation and annual maintenance are cheap and therefore do not restrain the installation of Low Cost VDR (LC VDR). Ship owners favor the introduction of such a system on boats because it proved that the LC VDR brings investigation opportunities to organizations involved in accident treatment.

Deviations from the project workprogramme, and corrective actions taken/suggested
No deviations or corrective actions to be reported.

2.5 Workpackage 5 : New functionalities and applications for VDRs

Workpackage objectives and starting point of work at beginning of reporting period
Objectives
- Development of new functionalities of VDRs
- Demonstrations on board of ships.

Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved

T5.1 Interface development between the VDR and structural constraints sensors
Currently the communication possibilities on board do not allow the free data exchange among electronic logbook and the VDR (Voyage Data Recorder). The current method based
on the NMEA 183 protocol does not even foresee an entry for the electronic logbook. On vessels, electronic logbooks can be put in a listener's mode, whilst the VDR is both speaker and listener. The NMEA 2000 communication architecture should provide this improvement. This is however still far from being implemented widely. If all software is coupled with the vessel's personal computer, the TCP/IP protocol is the best and easiest way forward. This study was documented in the report "communication between VDR and El. logbook" and belongs to Deliverable D26.

Then, any data exchange bears a number of problems in terms of data security. Fishing vessels need to regularly transmit their positions according to the Community regulation. However they want to keep it secret from the competition. Cargo vessels also prefer to keep secret what they carry, in particular to avoid terrorist attacks. JRC has analyzed the most advances data security methodologies and investigated their applicability on onboard data exchange systems. The report has been issued as annex to D3.

In the demonstration Kelvin Hughes VDR systems was interfaced to Kongsberg Maritime K-Log Electronic logbook and provide data to this system. The main objective was to test the physical installation, the data flow, and show that both parts were easy to set up interface and test.

The demonstration showed that as long as you use well defined industrial standards, as for example NMEA-0183, the interfacing between different systems and equipment is quite straight forward.

The setup and physical interfacing between the two systems was done in less that 1 hours and the data flow from the VDR to the electronic logbook was directly up and running. The data flow from the VDR was standard NMEA telegrams and hence the logbook could use these data directly. For instance the position field was directly filled in by the position data from the VDR.

The planned scope of the electronic log book application and the demonstration was to show that data stored in the VDR could be used to certificate the existing logbook with reference data originating from the VDR. This was fully showed in the demonstration.

**T5.2 Advanced logbooks applications with VDR data**

The K-Log system was updated by KM to function more flexible regarding the Oil Record Book part I. The last version installed onboard a couple of vessels and reported to work well. The Ballast logbook was designed initially and an initial version is included in the last version of the system. Further design and implementation were finally done.

**T5.3 Development of Integrated ECDIS/VDR Prototype.**

Objectives in this project are to achieve the following: develop a system capable of dual functionality - SVDR / ECDIS, the combined system; and demonstrate the systems dual capability by actually using the VDR to record the data shown on the ECDIS display.

The results of the demonstration were analyzed using the captured data from the white box and the Kelvin Hughes replay software. The ECDIS system which was running on the main display was captured during operation by the standard video capture functionality of the VDR.
system. This meant we had a screen grab of operation every 15 seconds and we can clearly see the ECDIS Ark Forwarder in various positions on her routine passage. The replayed data clearly demonstrates the recorded data from the Radar, ECDIS & the other NMEA data, interfaced with SVDR. It was important to demonstrate not only that the ECDIS system was running and being used but also that the basic VDR functionality was operating alongside this in its regulatory mode. The data analyzed above showed fully that the combined system firstly had no effect on the primary VDR functionality and secondly that the ECDIS system was fully functional when running from the single hardware platform.

Deviations from the project workprogramme, and corrective actions taken/suggested D23 about the “Integrated ECDIS/VDR prototype” was developed by KM in advance.

2.6 Workpackage 6 : Dissemination and exploitation

Workpackage objectives and starting point of work at beginning of reporting period
- To ensure the projects results are disseminated in Manufacturers, to Maritime Authorities, shipping and fishing companies, Associations and Organisations.
- To prepare the future commercialisation of the products developed during the project.

Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved

T6.1 Dissemination and knowledge protection
During this second reporting dissemination activities were carried out by some of the project partners:
JRC prepared an article entitled “Electronic logbooks managing the data flow”. It was published in Digital Ship in March 2008.

The project was presented in September 2007 by UoS at the Rijkswaterstaat (Dutch Ministry of transportation and Water Management) in Delft, Netherlands, to Cas Willems who is MarNIS Project Manager. Then at the MarNIS demonstration in Genoa, EMDM project was presented to Jean-Bernard Erhardt, Deputy Director of Maritime Safety Division, DG for Infrastructure, Transport and the Sea in France, and to Christos Hadjichristou, Counsellor, Embassy of Cyprus at Brussels. Other presentations were done to the Director of HongKong Shipowners Association by KH in December 2008, to the secretary General of CIRM, to UK MCA, MAIB and other IMO representative bodies including NGOs.

Avenca participated to the Marine Accident Investigators’ International Forum in Valetta (Malta) in September 2008, and to the CMA - Investigating suitability of Trade show in the USA in March 2009.

EQY and SODENA published an article on Cordis in March 2009.
T6.2 Marketing plan
The Marketing report resumes all the analysis to be reported for each partner.

T6.3 Commercialisation agreement
No Commercialization agreement has been elaborated as the partners developed different modules dedicated to different type of clients.

Deviations from the project workprogramme, and corrective actions taken/suggested
No deviations or corrective actions to be reported.

2.7 Workpackage 7 : Management and co-ordination

Workpackage objectives and starting point of work at beginning of reporting period
The objectives of this work package are:
- To ensure that support activities are well co-ordinated (no overlapping of work), and well done (deliverables provided on time, and with a sufficient quality);
- To ensure that EC financial & administrative procedures are respected and that cost statements are provided on time;
- To ensure the link between the partners, and between the EC and the project consortium.
SODENA is leading this work package.

Progress towards objectives – tasks worked on and achievements made with reference to planned objectives, contractors involved

T7.1 Administrative & Financial management and reporting
EQY organised a Financial reporting at 6-month helping the partners to know how to report their costs and preparing them to complete the 1st reporting period requirements. All the partners send their costs at 6-month and a financial statement of the project at 6-month was posted by EQY on the restricted website of the EMDM project.
SODENA with the support of EQY sent a letter requiring an amendment to the contract that changed the Technical Annex by:
- removing the reference to the no more existing SVDR,
- changing some deliverables deadlines to be more accurate on the project implementation,
- modifying the dissemination level of D6 and D7 from PP (programme participants only) to PU (Public) to support the activities in WP.1- T1.4b for submission to IMO.

T7.2 Project technical co-ordination
EQY requested a bimonthly advancement report to all the partners and drafted a synthesis on the work progress that was posted on the restricted website of the project.

T7.3 Knowledge and information flow management
In the restricted website developed by EQY, the project partners can post and download information about the project progress, deliverables. Contractual documents and technical and financial management tools are also available on this website.

Deviations from the project workprogramme, and corrective actions taken/suggested
No deviations or corrective actions to be reported.
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D24 Electronic logbook with VDR reference prototype  5  September 1st, 2008  December 2008  KH
D25 Demonstration of ECDIS / VDR prototype installation  5  November 1st, 2008  February 2009  KH
D26 Report on the demonstration of ECDIS / VDR prototype installation  5  January 1st, 2009  February 28, 2009  KH
D27 Demonstration of an advanced logbook  5  January 1st, 2009  February 2009  KH
D28 Report on the demonstration of an advanced logbook  6  January 1st, 2009  February 28, 2009  SODENA
D29 Dissemination report  6  March 1st, 2009  February 28, 2009  SODENA
D30 Guide for low cost SVDR retrofitting  6  March 1st, 2009  February 28, 2009  SODENA
D31 Marketing plan  6  March 1st, 2009  February 28, 2009  SODENA
D32 Commercialisation agreement  6  March 1st, 2009  NONE  SODENA
D33 Final report  7  March 1st, 2009  April 2009  SODENA
D34 Quality manual  7  June 1st, 2007  May 10th, 2007  EQY

- List of milestones, including due date and actual/foreseen achievement date

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SECTION 3 – CONSORTIUM MANAGEMENT

Table 5: Workpackages - Plan and Status Barchart

PROJECT BARCHART and STATUS

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<th>Workpackage 1:</th>
<th>Improvement of standards for VDRs</th>
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<td>Task 1.1</td>
<td>Review of VDR legislation</td>
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<td>Task 1.2</td>
<td>Survey to improve existing standards and specifications for VDRs</td>
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<td>Task 1.3</td>
<td>Workshop in common with WP1 and WP2</td>
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<td>Writing of standards for VDRs and SVDR</td>
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<td>Assessing additional functionalities of electronic logbooks</td>
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<td>Interface developments for vessels not equipped with ECDIS</td>
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<td>Task 4.3</td>
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All the EMDM project partners participated in 3 co-ordination meetings:
• A 12-month meeting in Ispra on March 7th, 2008.
• A 18-month meeting in Hainault on October 8th, 2008.
• A 24-month meeting in Stockholm on February 10th, 2009.

Some of the partners (WorkPackage Leaders and Coordinator) also attended the Review Meeting on June 10th, 2008 in Brussels.