PROJECT PERIODIC REPORT

Grant Agreement number: 243689

Project acronym: TEAMSAFETY

Project title: The development project for an innovative 3D virtual team-training maritime safety simulation platform to meet the latest EU safety requirements for sea and seafarers' emergency response training within the various maritime industries

Funding Scheme: Research for the Benefit of SME Associations

Date of latest version of Annex I against which the assessment will be made: 01/10/2010

Periodic report: **2nd**

Period covered: **from 1st November 2011** **to 31st October 2012**

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Contents

1 Publishable summary

Summary

TeamSafety is a two-year project funded by the European Commission's Framework 7 Programme within the 'Research for SMEs Associations' scheme.

The TeamSafety consortium is made up of a well balanced team of organisations who have been selected on the basis of their expertise in fields that are complimentary to the projects development.

The specialist knowledge of each consortium member covers a number of subject areas including maritime training, computer gaming software, voice analysis software and the maritime environment in general.

This summary highlights the projects scope; progress made during the final reporting period and details the consortium participants.

The Need

Around 90% of goods traffic to and from the EU member states is transported by sea. Therefore the maritime sector is of significant importance to the economic competitiveness of European business and industry. However, due to its very nature, it is also one of the most dangerous industries.

Due to this danger it has been highlighted that for some time there has been a shortage of skilled and well trained seafarers. Official statistics show that 80% of recent marine accidents, and 96% of casualties, have resulted from human error of some sort.

There is also the need to ensure the European maritime environment is protected from oil spillages in the sea as a consequence of these accidents.

The Solution

The European Union has previously attempted to solve maritime problems with technical solutions at ship level leading to changes to ship design, emergency & abandon ship improvements and state of the art fire prevention systems. These have seen an improvement in emergency facilities: however these ultimately deal with the effect of an incident and not the cause.

Most existing maritime training focuses on practical exercises and drills. These can train specific actions, but even larger ship based drills cannot fully and realistically re-create the actual crisis situations.

The TeamSafety project's approach is to develop an innovative 3D interactive and immersive computer based training system. By the use of state-of-the-art gaming engine technology, coupled with the innovative use of tonal speech recognition and the implementation of enhanced Human Interface Devices (HIDs), all tailored to the maritime industry, TeamSafety aims to provide a training environment superior to anything currently on the market.

By placing mariners in this environment we will significantly improve the training experience for the trainee through:

- Promoting a more accurate situational response by creating a more realistic and immersive training environment

- Being able to work collaboratively with other team members in actual crisis situations. The target being up to 30 trainees at a single location and multiple locations
- Communicate, issue commands internally, between crew members of the emergency response teams onboard and externally, between ship and shore-based assistance stations (like VTS, company offices etc.) and make decisions in actual crisis situations
- Act under realistic conditions of a crisis situation (taking into account movement of a ship according to sea state and enhanced representation of temperature (heat) and humidity)
- Trainer feedback on the full scenario for all participants

Once available, Team Safety based training will result in better trained ship crews through increasing their experience of actual crisis situations, thus improving emergency preparedness and levels of safety consciousness.

This will have the wider benefits of:

- Significantly decreasing the chances of sustaining injury or loss of life.
- Preservation the marine environment by reducing the potential for oil spillage
- Reducing economic loss by minimising business interruption, loss of property and equipment

Progress and Achievements

To achieve the objectives of the TeamSafety project, TeamSafety was split into four defined phases, each containing defined work packages (WPs), with associated tasks and deliverables.

- Phase 1 (WP 1) – Months 0 -6:

  To research and analyse the current state-of-the-art in current maritime training, tonal speech recognition and HIDs. Identify the basic requirements and architecture for the game engine and investigate the management of crisis scenarios within the simulation.

- Phase 2 (WP 2, 3 & 4) – Months 7 - 16:

  This is the main development phase. Here the detailed design work to generate the game architecture, environment and scenario handling is completed. It also covers the design of the tonal speech recognition software and the development of the HID solution.

- Phase 3 (WP 5) – Months 17 - 24:

  This phase sees the finalisation of the specific maritime content. The integration of the components developed in WPs 1 – 4 and beta testing of the prototype solution.

- Phase 4 (WP 6) – Months 0 - 24:

This phase runs for the duration of the project. It covers the exploitation and dissemination strategy for TeamSafety. This will include managing any appropriate IPR and patents.

This report covers the activities from Month 10 to Month 24 which encompasses progress against Phase 2, Phase 2 and Phase 4.

This includes the following aspects:-

- Design of the architecture of the scenario progression handler toolset and its functional description.
- Design and develop middleware component to incorporate the SPH into the game engine
- Generate a comprehensive methodology for crisis scenario design and control
- Generate and integrate the generated crisis scenario into the SPH
- Develop software-based algorithms for trial speech recognition (TSR)
- Design and develop parametric middleware to integrate TSR into the game engine
- Develop understanding on human facial expressions and cross reference to TSR
- Design and develop a middleware component to emulate on-screen gesture expressions
- Design and develop the architecture to integrate PC-HIDS into gaming engines
- Design hardware and software into the virtual environment
- Design the Teamsafety maritime content
- Develop specific Teamsafety maritime content
- Integration of components from WP1 – 4
- Beta Testing and validation
- Protection of IPR
- Knowledge absorption by proposers
- Dissemination of knowledge
- Socio-economic aspects
- Development of the exploitation strategy
- Uptake of the technology through training activities

The project website has been updated and is being used by consortium members for the storage and distribution of key project documents.

The Consortium

The project consortium is made up of the partners listed below.

They are all experts and professionals in their field, committed to the project and passionate about the improvements and benefits TeamSafety can bring to the maritime sector in Europe.

Participant	Key Attributes	Location
World Maritime University	Expert knowledge on maritime accident investigations	Sweden
Unity Studios ApS	Provide game engine architecture	Denmark
The Nautical Institute	Expert maritime knowledge and exploitation management	UK
Ask Safety AS	Maritime training provider	Norway
Sea & Shore Safety Services	Maritime training provider	Ireland
Bulgarian Maritime Training Centre	Maritime training provider	Bulgaria
Intelligent Systems Research Institute	Software R&D for tonal speech recognition and HID	UK

A total of 4 Consortium meetings have been held during the second period, more detail of which can be found in the Management Report. Further meetings using teleconferencing have taken place to discuss any issues that took place outside of the regular Consortium and RTD meetings.

The consortium worked well together during the project, having provided valuable input and direction for research and development activities whilst performing valuable work in specific areas of the work programme. The project has made excellent progress and we believe we have been successful in achieving the key objectives of the TeamSafety project.

Contact

For further information on the TeamSafety project, please visit the projects main web site at:

http://www.team-safety.eu

Or contact the project coordinator, Mr Michael Baldauf (mailto:mbf@wmu.se)

2 Project objectives for period 2

Period 2 of the TeamSafety project (1st August 2011 to 31st October 2012) comprises of a set of defined work packages and associated deliverables.

Work Package List – Period 2						
WP. No.	**Work Package Title**	**Activity Type**	**Lead Participant**	**Months**	**Start Month**	**End Month**
2	Scenario progression handler	RTD	Unity	43.84	7	16
3	Gesture emulation based on tonal speech recognition	RTD	ISRI	27.67	7	16
4	Human interface devices	RTD	ISRI	28.86	7	16
5	Integration and validation	RTD	Unity	41.44	17	24
	Innovation, dissemination and training	OTH	NI	14.84	1	24
7	Consortium management	MGT	WMU	6.00	1	24
8	Project management	OTH	Unity	5.52	1	24

Deliverable List – Period 2						
Del. No.	Work Package Title	Lead beneficiary	Nature	Dissemination level	Target delivery month	Actual delivery date
2.1	SPH /MPD Architecture report	WMU	R	CO	12	12/12/2011
2.2	SPH / MPD Technical Integration report	Unity	R	CO	16	11/07/2012
3.1	Technical report on TSR algorithms	ISRI	R	CO	12	02/12/2011
3.2	Technical report on TSP and gesture emulations	ISRI			16	27/04/2012

4.1	Technical report on cross functional mapping between PC-HID's and MRTS	ISRI	R	CO	12	05/12/2011
4.2	Report on PC-HIDs and MRTS integrated to virtual environment	ISRI	R	CO	16	23/03/2012
5.1	Technical report on TeamSafety Maritime content	Unity	R	CO	21	14/02/2013
5.2	Integration report	Unity	R	CO	21	7/12/2012
6.1	Patent application	NI	O	CO	24	Include-D6.4
6.2b	Final exploitation plan (revised)	NI	R	CO	24	14/02/2013
6.3	Dissemination and exploitation events	NI	R	CO	20	Included in D6.4
6.4	Exploitation agreement	NI	D	PU	24	7/12/2012
7.1.1	Delivery of periodic reports (RP1)	WMU	R	CO	9	3/10/2011
7.1.2	Delivery of periodic reports (RP2)	WMU	R	CO	24	814/02/2013
8.1.2	Provision of minutes taken at project management meetings	ISRI	R	CO	24	7/12/2012
8.2	Project Website	DII / ISRI	R	CO	3	26/11/2012

This is the project's second interim report and the following comments from the Period 1 Assessment Report have been taken into account in this report.:-

- D8.2 – Project Website was rejected. Comments made suggested graphics were appealing however, the news and events section were out of date. The website has since been updated and a full report submitted.

D6.2.a – Interim and Exploitation Plan. Comments included the report as being preliminary, generic and the Joint Venture remaining unresolved. The Final Exploitation plan provides the finalised details on the proposed Joint Venture and further information on Dissemination activities.

3 Work progress and achievements during the period

Work Package 2 Summary – Scenario Progression Handler

The Objectives for Work Package 2 are:-

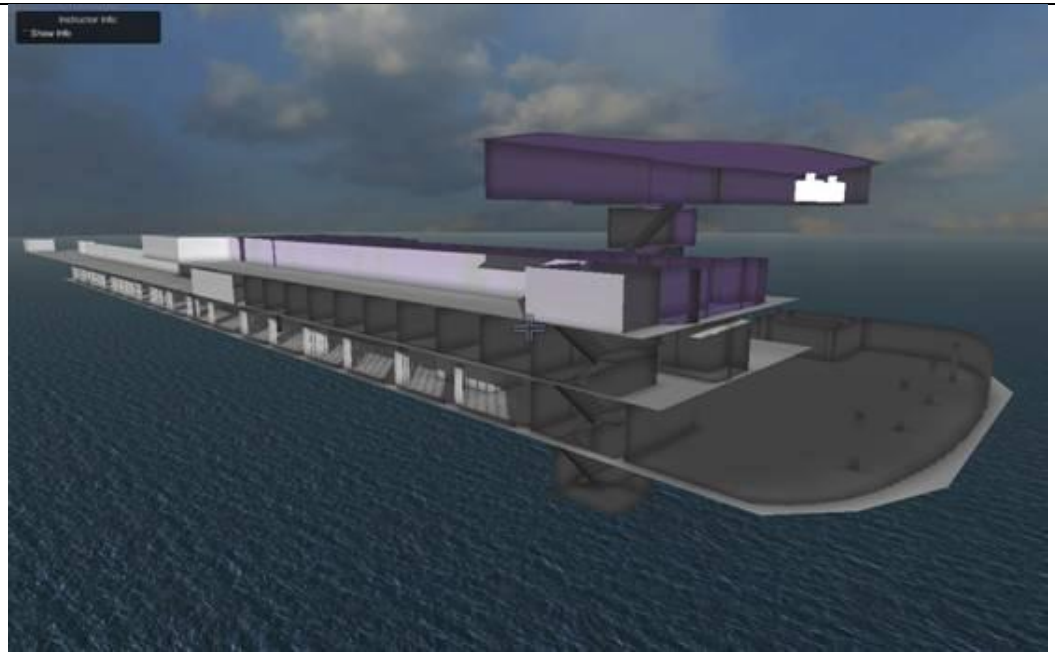
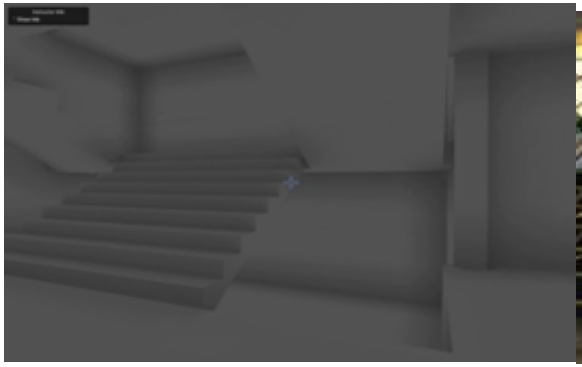
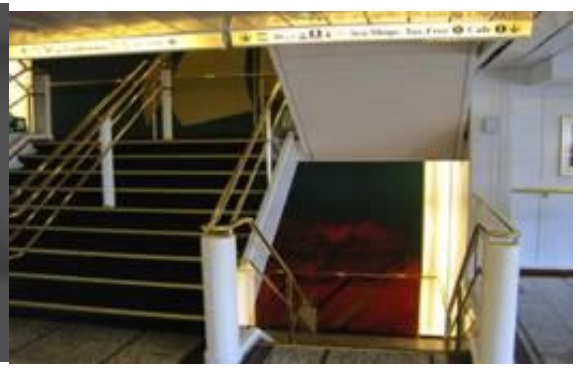
- Design the architecture of the SPH toolset and the functional description based on the findings of WP1.
- Design and develop a middleware component to incorporate the SPH into the game engine.
- Based on WP1, generate a comprehensive methodology for crisis scenario design and control.
- Translate and integrate the generated crisis scenario knowledge into the SPH.

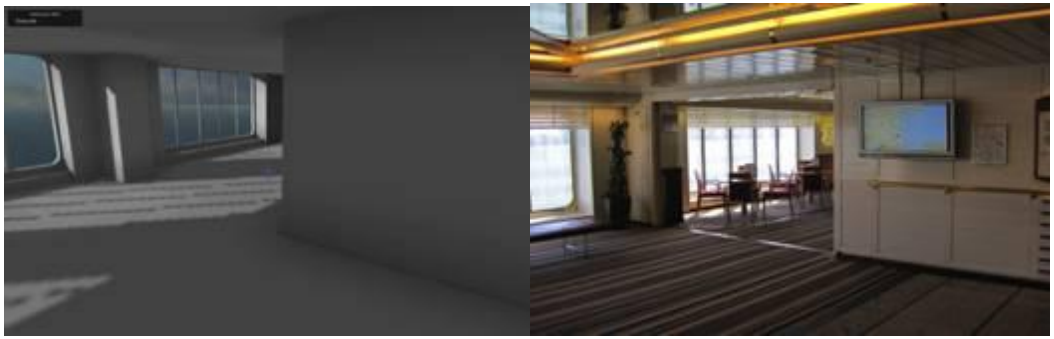
Deviations from Annex 1 are:-

Following the work undertaken in WP1, it was identified that although several accident databases were available, none contained a suitable structure for use as an input to the scenario control of TeamSafety. It was also decided that to set-up a Marine Parameters database (MPD) as described in Annex 1 would actually constrain the way crisis scenarios could be defined and implemented. It was discussed and agreed that it would be better to generate the scenarios directly, as a scenario design document: it was agreed these would allow them to be more accurately designed, whilst still allowing the flexibility to make changes. This scenario document has been generated by the SMEs and Unity and has replaced the MPD. The work required to implement the defined scenario into the game engine remains the same.

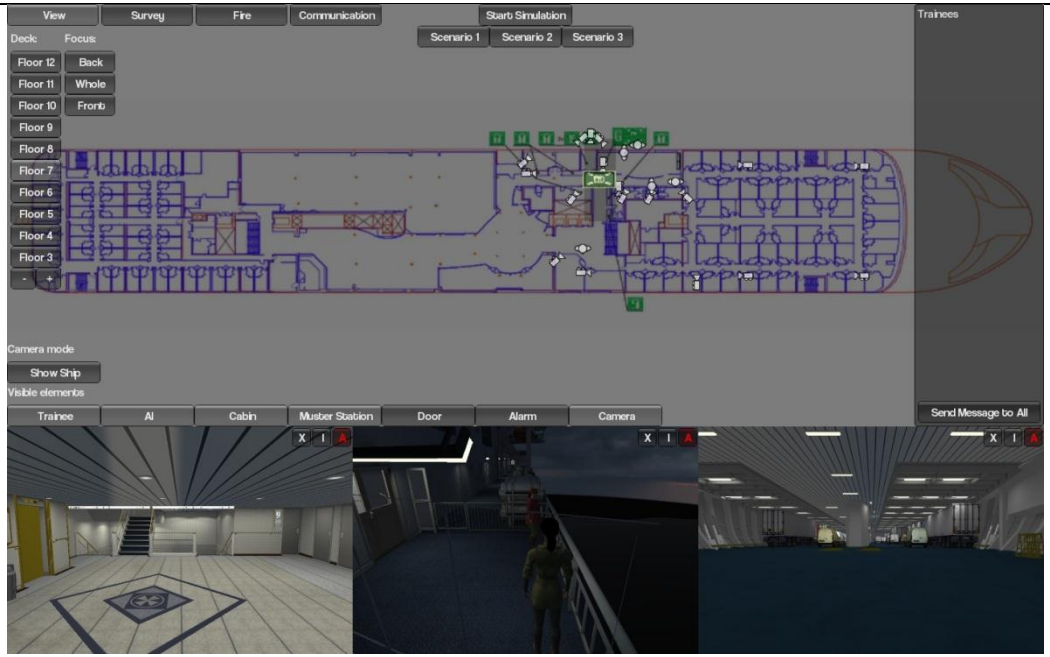
Task		Progress, Results and Achievements during Reporting Period
2.1	Design the architecture of the SPH toolset and functional description	**This is 100% complete** This task covers the development of the maritime gaming architecture, i.e. the scenario progression handler (SPH). The basic game architecture was known from the beginning of the project as this is the Unity 3D game engine, which Unity Studios is using for all of their projects. The challenges were to define: • What the maritime content was • How to integrate it into main game engine Through a number of teleconferences early in the project and also actual ship visits, the consortium has progressed with the definition of the maritime content, i.e. what type of ship to be used, which decks, technical facilities, safety equipment etc. This will also cover the actual crisis situation being implemented. The top level architecture was initially designed and was then progressed through the various levels of detail with the aim of defining the full maritime scenario required and how this would be presented and controlled.
2.2	Design and develop a middleware component to incorporate the SPH into the game engine	**This is 100% complete** This task involved developing the computer-controlled environment that the trainees will interact with. Although not due to start until M10, it was decided that to support the progress of Task 2.1 an early software version was developed. This enabled the partners to see how the simulated environment would look and operate at a basic level to enable the SPH architecture and function be better defined. This basic early version consisted of: • Setting the architectural framework of the virtual world (based on four decks of ship, the Crown of

Task		Progress, Results and Achievements during Reporting Period
		Scandinavia), i.e. creating a ‘block-out’. This includes o A simple collision mesh to prevent users’ avatars and computer controlled characters from walking through walls and falling through decks o A simple navigation mesh to allow the artificial intelligence (AI) to calculate paths between two locations (pathfinding). • Creating the AI of the computer controlled characters, i.e. passengers. This includes the following elements: o Pathfinding o Navigation and obstacle avoidance o Behaviour Tree The virtual environment was blocked out, including simple collision and navigation meshes.

Task		Progress, Results and Achievements during Reporting Period
		 **Outside view of the blocked out decks.**  

Task		Progress, Results and Achievements during Reporting Period
		Blockout Photo **Stairways, block-out and the real-life Crown of Scandinavia**  Blockout Photo **Hallway, block-out and the real-life Crown of Scandinavia**  t **Restaurant, block-out and the real-life Crown of Scandinavia**

Task		Progress, Results and Achievements during Reporting Period
		The AI was navigating the block-out across all four decks using an initial pathfinding algorithm and simple obstacle avoidance. Based on these early experiments and discussions, the crisis scenario that the simulation should support, was developed (Task 2.4). This resulted in a different layout of the ship (see task 5.2) but the technical work was carried over and expanded on throughout the project.
2.3	Generate a comprehensive methodology for crisis scenario design and control	**This is 100% complete** The TeamSafety platform is designed as a virtual world framework, offering a high degree of autonomy to the various subsystems. As an example, the behavioral part of the AI system can be expanded on to display other reactions needed to support a new type of scenarios without the pathfinding system, geometry, collision meshes etc., which are parts of the framework, need changing. As for controlling the scenario, it is important to understand that TeamSafety is a simulation, which means that some subsystems have a life of their own so to speak. The fire spreads based on a computer model, the passengers have artificial intelligence etc. The outcome of a scenario is first and foremost dependent on the trainees' actions. However, as an instructor, there are a number of ways one can impact the events unfolding. The current scenario kicks off with a fire on deck 3. This fire will start until an instructor decides to begin the scenario. Furthermore, the instructor interface offers a whole range of opportunities to view the progressing scenario from different angles and overview maps as well as listening in on all communications. With full access to the communication channels, an instructor is able to role play as needed to guide or challenge the trainees. "Possessing" an otherwise computer controlled passenger to role play in the simulation is also possible. Another option available is interfering with fire doors, sprinkler systems etc.

Task		Progress, Results and Achievements during Reporting Period
		 The instructor's role is shifted more towards observing and only interfering where necessary and away from having to drive the scenario forward as usually seen in e.g. tabletop exercises
2.4	Generate and integrate the generated crisis scenario into the SPH	**This is 100% complete** The scenario developed by the SME's, which is described in a separate document, is supported by the current version of the TeamSafety software. The simulation's ability to support this scenario was demonstrated at the Malmö Trials.
2.5	Risk assessment WP2	This was an on-going activity throughout the project to identify risks both to the relevant work package and to future

Task		Progress, Results and Achievements during Reporting Period
		work packages. These risks were then reviewed and action plans agreed where required.

Work Package 3 Summary – Gesture emulation based on Tonal Speech Recognition

The Objectives for Work Package 3 are:-

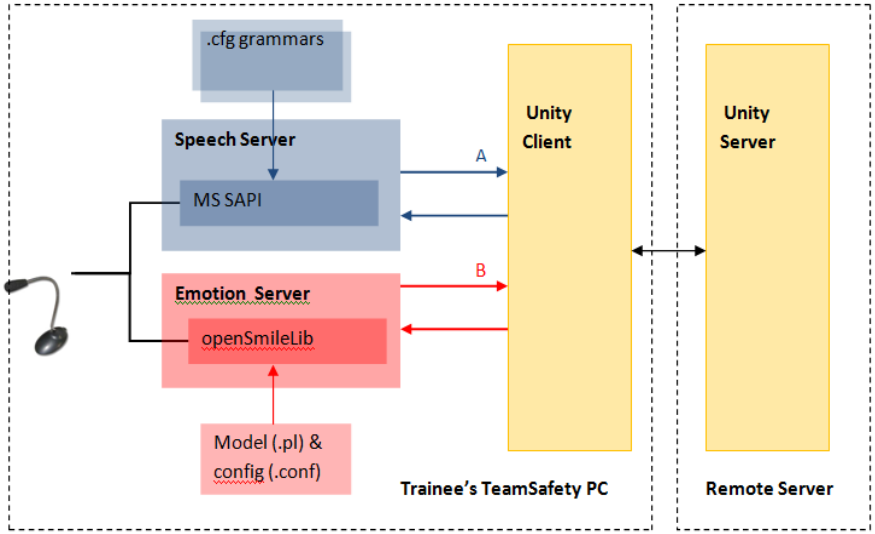
- Develop software-based algorithms for Tonal Speech Recognition (TSR).
- Design and develop middleware to integrate the TSR software into the game engine.
- Develop understanding on human facial expressions and cross reference to TSR.
- Design and develop a middleware component to emulate on-screen gesture expressions.

Deviations from Annex 1 are:

No major deviations identified.

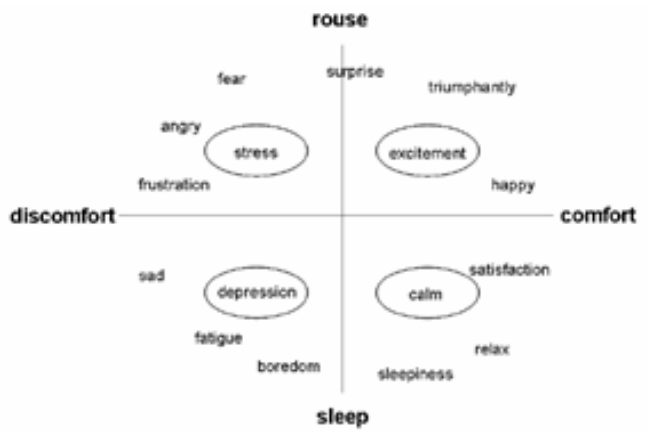
Minor changes to wording in Annex 1 for this work package have been identified to clarify the inaccurate use of 'visual' speech recognition terminology, see Work Package 1 summary for more detail.

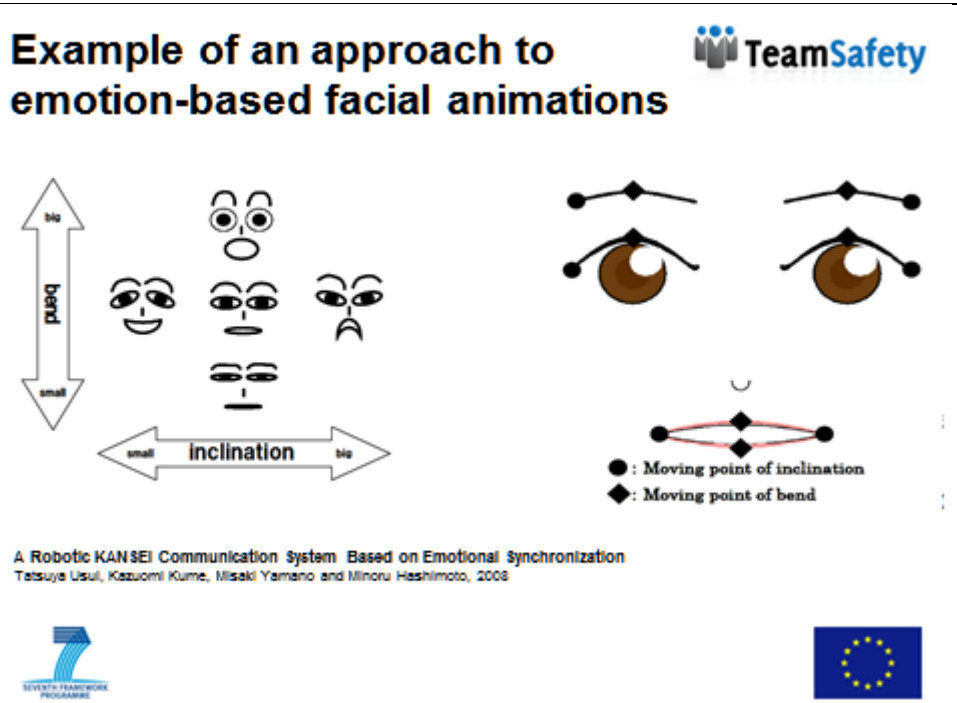
Task		Progress, Results and Achievements during Reporting Period
3.1	Develop software-based algorithms for Tonal Speech Recognition (TSR)	**This is 100% complete** Speech Recognition and Interpretation system was developed in C# .Net for TeamSafety, utilising Microsoft SAPI (Speech API) technology, with a bespoke socket server comms layer. Emotion Recognition was developed, again with a C# .Net layer wrapping an 'openEar' emotion engine with its own bespoke socket server comms layer.

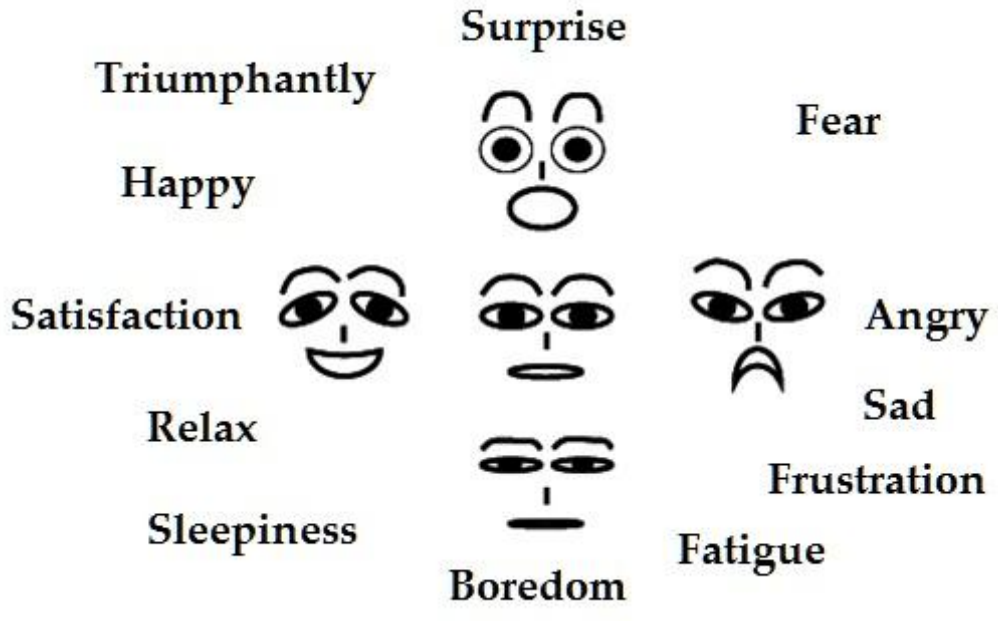
Task		Progress, Results and Achievements during Reporting Period
		The physical architecture of TeamSafety is described in report 3.1; by way of summary, the architecture comprises a network of TeamSafety PCs (one PC per trainee) connected to a TeamSafety Server (local or remote) that is responsible for coordinating communication and running the CPU intensive physics engines. Each TeamSafety PC runs its own independent copy of a Speech Server and Emotion Server on its local host. These two servers communicate with, and are controlled by, client code (the 'Unity Client') within the Unity software that also resides on the trainee's PC. **Error! Reference source not found.** Shows the architecture of the Speech Server, Emotion Server and Client application. The arrows labelled 'A' indicate socket communication between the Speech Server and the Client; 'B' is the socket communication between the Emotion Server and the Client. The two servers operate independently on separate ports.  Figure 1 High-level View of Tonal Speech Recognition Architecture

Task		Progress, Results and Achievements during Reporting Period
		Software developed for this work package included • Configurable Speech Server – imports compiled Speech Grammar Files (.cfg files) and uses XML for the grammar to action ID mapping. The action ID is reported back to the Unity Server and provides the unambiguous interpretation for the spoken words. • The Speech Client software (for integration into the Unity software) and also a test GUI that demonstrates the client-server in operation. • The Emotion Server. Like the Speech Server, this uses socket-based comms to communicate with the Emotion Client • The Emotion Client – this sends and receives socket based commands. The client sends instructions to turn on and off the server; it receives a stream of speech 'arousal' level in the range 0 to 250 (250 being most 'aroused', where arousal is essentially the measure of stress and agitation in the speaker). A bespoke Grammar Builder application. This enables the user to build grammar files simply from a GUI rather than the laborious and error-prone hand-coding of XML files.
3.2	Design and develop parametric middleware to integrate TSR into the game engine	**This task is 100% complete** In order to read people's emotions from their voice, they need to speak, thus a speech recognition system was implemented. This would both solve the problem of communicating with computer controlled characters (passengers) in an intuitive way and also give trainees an incitement to actually speak so that we could get a voice snippet to read emotions from. However, based on the findings of T3.3 and the tests of available methods to reliably read the state of mind of a person from the tonal aspects of their voice, the consortium felt that it was unlikely that the implementation of TSR could be brought to work at a satisfactory level to enhance the training. Therefore, it was decided that further work

Task		Progress, Results and Achievements during Reporting Period
		to implement TSR would not yield sufficient benefits to warrant the continued efforts.
3.3	Develop understanding on human facial expressions and cross reference to TSR	**This is 100% complete** This task involved research into codifying facial expressions in a way where 1. The emotion of a trainee could reliably be told from a combination of the TSR and other circumstances in the running application in order to select a meaningful virtual facial expression to match. 2. It would be possible to visualise said expressions with an animation system. The model for deducing an emotion from TSR and the circumstances of the trainee, was suggested to be based on Russell's circumplex model of emotion where TSR and context could be mapped on each their axis:

Task		Progress, Results and Achievements during Reporting Period
		Russell's circumplex model of emotion  Based on Tonal Speech Recognition (arousel factor) Based on context within the simulation (proximity to harm, alarms etc.) Looking at how best to map the above model to a number of facial expressions, attention was turned to Yamano and Minoru's work on human-robot communication. The below models show a two-axis approach to facial expressions.

Task		Progress, Results and Achievements during Reporting Period
		 While it does not make sense to map the two models' axes as they are represented here, it would be entirely possible to flip the x-axis of one of the models and then select four extremes on Russel's model to match the four extremes of the suggested facial animations. Any emotions in-between these four extremes could be visually represented by morphing between the four facial expressions.

Task		Progress, Results and Achievements during Reporting Period
		 A SWOT analysis on cross-referencing facial expressions with TSR revealed the following: • Strengths - An intuitive way to read emotions - Lots of research point towards simple ”rules” • Weaknesses - The trainee has to face the avatar displaying the expression, as the size of monitors and HMD’s does not allow for peripheral vision. - Trainees must be close-up to avatars to actually see the expressions due to the wide field-of-view of

Task		Progress, Results and Achievements during Reporting Period
		the in-game camera necessary to obtain just a bit of situational awareness. • Opportunities: - The facial animations could be enhanced with body language. • Threats - No technology has been discovered that can consistently match the accuracy of human perception when it comes to reading emotions. By implementing this system, we risk not enhancing but obscuring the vis-à-vis communication. - The facial expression can only be applied once the TSR system has analysed an amount of speech. This could result in the following: • The facial expressions are applied after a short conversation has ended and the trainees have turned/moved away. A longer conversation may include multiple shifts in emotions, which could lead to applying the right expressions at the wrong time. The result will be a continuous mismatch between message and emotions.
3.4	Design and develop a middleware component to emulate on-screen gesture expressions	**This task is 100% complete** In order to display gestures to enhance communication by nonverbal signals, a life-like avatar that somewhat resembles the controlling trainee is needed. The importance of the avatar's appearance is a question of not taking away the focus from the actual communication, which could happen if e.g. the avatars were comic or a lot of attention would be needed to figure out which trainee was actually controlling a given avatar. Therefore, a character system and a character creator (explained in D5.1 Technical Report on TeamSafety Maritime Content), was implemented. The characters can be divided into crew and passengers. They exist in both male and female versions with the

Task		Progress, Results and Achievements during Reporting Period
		option to change height, weight, skin colour and hair colour. • Officer • Officer Tech • Tech • Hotel • Firefighting suit The passengers have a number of clothing items that are randomised together with their physical properties to offer a variety of different looks. Each character consists of 1,500 – 2,000 polygons and four textures. Effectively, this gives a near-infinitely amount of variations. Here is a small selection:

Task		Progress, Results and Achievements during Reporting Period
		 A gesture system could be implemented in one of two ways. Either the gestures would need to be automated based on the same type of system awareness (TSR and context) that was outlined in section 3.3 regarding facial expressions or a trainees would have to control the gestures of their avatars manually. The former approach suffers from the same fundamental timing issues as explained in section 3.3 and both approaches would suffer from the issues regarding the limited field of view as described also in section 3.3. An additional concern about the manual approach was that it would present an even steeper learning curve for trainees, especially those who are not computer game savvy. While such a system would not be overly complex to develop from a technical point of view, the controlling of it by

Task		Progress, Results and Achievements during Reporting Period
		the trainees would be difficult and counterintuitive at best and most likely even damaging to the actual communication flow that it was supposed to enhance. Based on this analysis, further implementation of a gesture expressions system was halted.
3.5	Risk assessment WP3	This was an on-going activity throughout the project to identify risks both to the relevant work package and to future work packages. These risks were then reviewed and action plans agreed where required.

Work Package 4 Summary – Human Interface Devices (HIDs)

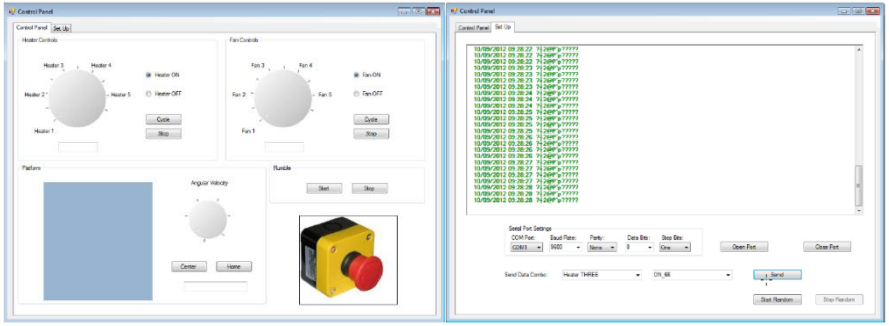
The Objectives for Work Package 1 are:-

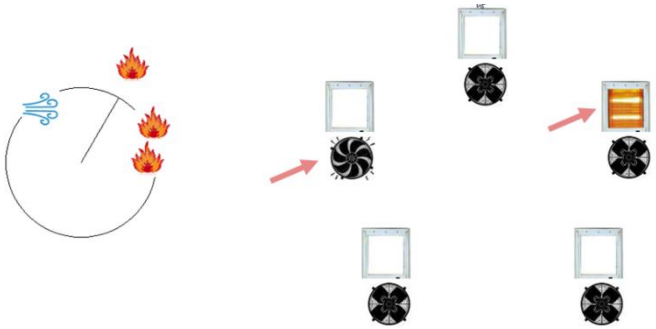
- Design and develop the architecture to integrate PC-HIDs into the gaming engines.
- Design hardware and software, where required, to support HIDs to provide an immersive training simulator environment.
- Integration of HID hardware and software into the virtual environment.

Deviations from Annex 1 are:-

No deviations identified.

Task		**Progress, Results and Achievements during Reporting Period**
4.1	Design and develop the architecture to integrate PC-HIDs into the gaming engines	**This is 100% complete** In brief, the 'Ultimate' TeamSafety simulator hardware comprises of:- • A moving base plate - This operates in two axes, pitch and roll, to simulate the movement of the ship at sea. • A vibration device – This simulate the smaller movements of the ships engines, or shocks in the case of explosions • Heaters – Five infra-red heaters simulate the heating effects of an on board fire at different locations around the user • Fans – Five electric fans simulate wind when going on deck and in combination with the heating elements, the movement of warm air related to a fire The visual interface is via goggles (Vuzix 1200R or 3D Trivisio Vrvision) – or a TV; a Microsoft Xbox game controller provides the trainee with navigation within the simulated training scenario; headphones with a microphone provide audio interaction (both with the software using the previously completed speech recognition system and with other users).

Task		Progress, Results and Achievements during Reporting Period
		These devices have standard PC interfaces and as such no special software is required beyond the driver software provided with these devices.
4.2	Design hardware and software to support HIDs in providing an immersive training simulator environment	**This task starts is 100% complete** Two software APIs were developed, the 'Hardware API' software interface to the hardware electronics and the de-coupled high-level software API 'Ultimate API'. The Ultimate API encapsulates the low-level hardware software commands of the Hardware API, insulating the TeamSafety simulation code from the lower-level and hardware specific command structures. This design ensures that any reconfiguration of the hardware will not impact on the simulation software.  An application was developed for testing the Hardware API (the 'Hardware API Control' application). The application's user-interface is depicted above. The application has two tabs – a Set-up tab and the Control Panel tab. The Controls Panel tab is used to actuate the articulating platform. Pressing the left mouse button and moving over a scratch-pad area sets the roll and pitch values, moving the platform in time with the user's mouse movement.

Task		Progress, Results and Achievements during Reporting Period
		Rotary knob controls are used to select the I.R. Lamps and Fans. Radio buttons are used to switch on and off the Rumble Panel device. See report 4.2 for more details.
4.3	Integration of HID hardware and software into the virtual environment	**This task is 100% complete.** The Ultimate API is the interface that is embedded within the Unity software and provides a layer of abstraction away from the physical devices on the rig. The Ultimate API is responsible for translating non-hardware-specific commands that are relevant to the simulated environment (such as a fire with intensity X at location Y) into hardware-specific commands that are relevant to the Ultimate TeamSafety simulator's hardware (such as 'switch on heaters 3 and 4 at 33% power'). The Ultimate API achieves this by calling functions on the Hardware API.  An application 'TestAPI' has been developed and packaged with the UltimateAPI code. It was developed to test the API code and also provide an example of how to call the functions within the UltimateAPI. The screen (above) is built by capturing the low-level HardwareAPI hardware calls; it verifies that the player's position and heading direction relative to fires and wind objects is reflected correctly in the hardware commands. This software allowed the UltimateAPI to be correctly implemented within Unity's software even though they did not have direct access to the rig hardware.

Task		Progress, Results and Achievements during Reporting Period
4.4	Risk assessment WP4	This was an on-going activity throughout the project to identify risks both to the relevant work package and to future work packages. These risks were then reviewed and action plans agreed where required.

Work Package 5 Summary – Integration and validation

The Objectives for Work Package 5 are:-

- Design the TeamSafety maritime content based on the Unity game engine SDK.
- Develop specific models, textures, collision connotation and inputs for the TeamSafety maritime content.
- Integration of components from WP1-4.

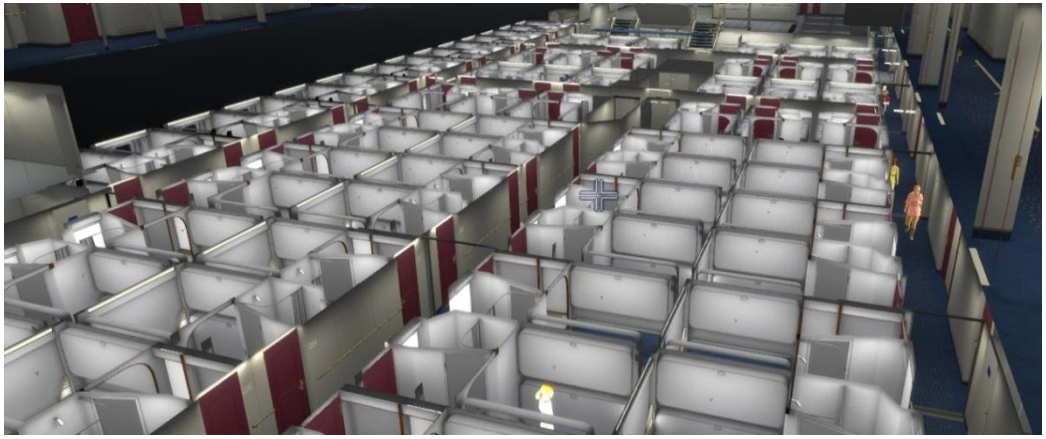
Deviations from Annex 1 are:-

No deviations identified. Deliverable 5.1 report us late and will be submitted within the reporting period.

Task		Progress, Results and Achievements during Reporting Period
5.1	Design the TeamSafety maritime content	**This task is 100% complete** The content design of the TeamSafety maritime safety training simulator was evolved over many iterations, some during consortium meeting workshops, other during Unity Studios internal review and design meetings.First preliminary versions of the maritime content were implemented as modular training scenarios for test purposes in the frame of maritime safety courses with students at WMU. The trials provided profound basis for the further

Task		Progress, Results and Achievements during Reporting Period
		development and implementation of the TeamSafety maritime content. The outcome of the design process is the actual content of the simulation, which is outlined in the Task 5.2 Section below.
5.2	Develop specific TeamSafety maritime content	**This task is 100% complete** This task involved the development of the visuals of the virtual world, which can be divided into the following categories: • 3D Environment (the ship) • Fire and smoke • Firefighting **<u>3D Environment</u>** The ship consists of the decks 3 through 12. It is more than 360,000 polygons and 150+ textures. Deck 3 and 4 are the car deck (double deck height) with an enclosed center section containing stairwells and a drencher control room.

Task		Progress, Results and Achievements during Reporting Period
		
		

Task		Progress, Results and Achievements during Reporting Period
		 Deck 5 is a passenger deck with more than 80 cabins modeled in the fore section and hallways leading to a firefighting equipment room to the aft. It also houses one muster station midship with an escape chute to the starboard side. 

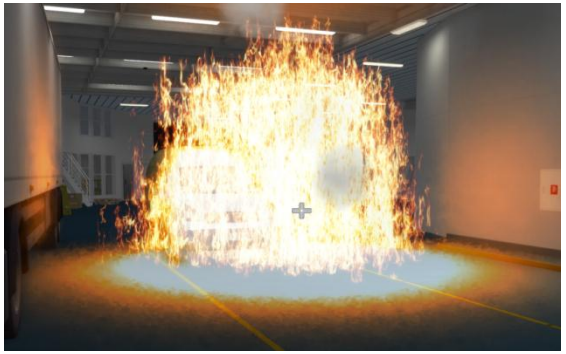
Task		Progress, Results and Achievements during Reporting Period
		 Deck 6 contains stairwells.  Deck 7 has the second midship muster station with an escape chute to the port side. It also contains a few offices, a youth club, rest rooms and a firefighting equipment room.

Task		Progress, Results and Achievements during Reporting Period
		 

Task		Progress, Results and Achievements during Reporting Period
		 Deck 8 and 9 contain stairwells.  Deck 10 has outside areas both port and starboard with stored rafts and boats. It also has a crew-only hallway leading to the bridge access.

Task		Progress, Results and Achievements during Reporting Period
		  Deck 11 has the bridge access stairwell. Deck 12 consists of the bridge itself.

Task		Progress, Results and Achievements during Reporting Period
		  **<u>Fire and Smoke</u>** A very important part of putting stress on the trainees, to fully test their operating procedures and communication skills, is fire and smoke. While a believable spread model for the fire is important on a tactical level, the visuals serve the purpose of impacting the trainees' on an emotional level. The fire illumination effect is the most advanced visual effect in the TeamSafety application. This effect creates the

Task		Progress, Results and Achievements during Reporting Period
		fire given the data collected from the fire simulation system. A shader, which is a program that runs on the graphics hardware and can be used to render advanced visual effects at high performance, is the main component of the fire visuals. The shader program retrieves data from the fire simulation and produces a visual representation of which cells are on fire. It then generates a group of animated particles for each cell that is on fire, giving the results of a fire. The shader also applies an illumination effect to objects around cells that are on fire, making them light up in fiery colours. The more intense the fire, the more intense the illumination effect will be.   The smoke effect is created by a custom built particle system. It generates a cloud of particles in the areas that the fire can spread to. These particles are invisible by default, but as the system gathers data from the smoke simulation, it controls the visibility of particles based on the density of the smoke.

Task		Progress, Results and Achievements during Reporting Period
		 The individual particles also move around in correspondence to the data generated by the air flow simulation. This gives the effect that the smoke is whirling around in the air. **Firefighting**

Task		Progress, Results and Achievements during Reporting Period
		As the fire spreads based on the actual simulation data, the fire will also diminish, if sprinklers or fire hoses are applied to cool down the area on fire. When any of these firefighting tools are active, particle systems are activated in order to visualise the water coming from the sprinklers and hoses. A particle system emits a number of textured particles each second. A tool in the Unity Editor is used for defining the following, among other things: • The shape of the emitter • The speed, size, life time and movement direction of the particles • The texture and shader applied to the particles The sprinklers emit particles from a hemisphere and apply gravity to send the particles downward.

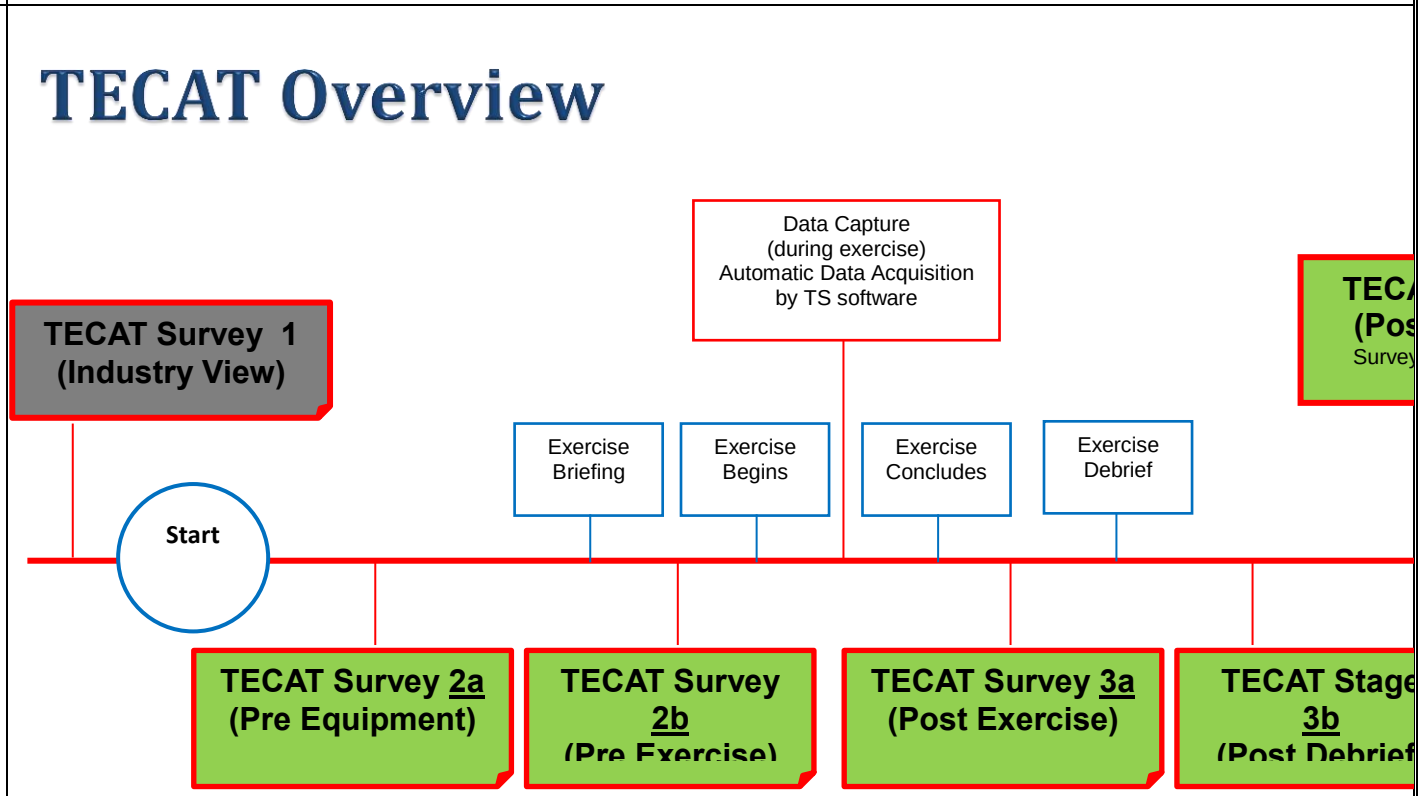
Task		Progress, Results and Achievements during Reporting Period
		 The fire hoses emit particles in a cone outward from the player's position and applies a forward force to spray particles away from the player. These particles are also affected by gravity, moving them downward across their life span.

Task		Progress, Results and Achievements during Reporting Period
		
5.3	Integration of components from WP1-4	**This task is 100% complete** Most of the components developed throughout the project have been integrated as part of their development at the respective stages in the project as they interact with the rest of the simulation. Subsequently, testing and bug fixing has also been a continuous process and some work has therefore been done on most of the features up to the very end of the project period.

Task		Progress, Results and Achievements during Reporting Period
		The main components can be categorised as follows: • External Software Packages • Integrated Hardware • Unity Editor Tools • TeamSafety Simulation Subsystems The details of each component can be found in the deliverable 5.2 Integration Report.
5.4	Beta Testing and validation	**This task is 100% complete** **TeamSafety Training** Trainees undergoing exercises on the TeamSafety training platform become 'players' of a very sophisticated, highly interactive first person simulation 'game'. They are represented in the virtual environment by an avatar, visible only to the instructor and other trainees. Communications between instructor and trainee(s) are live and movement in world is, for the purpose of prototype testing, controlled by the trainee using a simple PC keyboard/mouse interface. For TeamSafety training, key areas of a Ro-Ro passenger ferry have been modelled to create a virtual shipboard environment. In this environment, four trainees fill the roles of key crewmembers on board and through completion of a specially designed training scenario, develop a greater understanding and appreciation of the non-technical skills required of seafarers: leadership, teamwork, effective communications etc. The training scenario was developed using the methodology of a learning objective oriented approach, and applied to the fire scenario on a RoRo passenger ferry which includes the decision making for evacuating passengers from the ferry. **Assessing Training Effectiveness** A core focus of the exploitation strategy is to assess the effectiveness of TeamSafety training by implementing an evaluation methodology that will capture, interpret and assess the performance of trainees enrolled in training. By

Task		Progress, Results and Achievements during Reporting Period
		further tracking the knowledge, skills and attitudes (KSAs) of trainees after training is complete, it is anticipated that further insight will be gained into the transfer of KSAs from the TeamSafety training room to the operational environment. In order to develop and propose a unique evaluation methodology for the TeamSafety platform it was first necessary to survey the training landscape in a number of relevant fields to consider the models and methods employed in simulator based training (SBT) today. Providing a backdrop for this research was the work of Donald Kirkpatrick who in 1959 developed a training evaluation model comprised of four levels of training evaluation. The Kirkpatrick Model The Kirkpatrick model describes four steps for evaluating the impact of training. It addresses four training outcomes designed to be measured in order to assess the impact of an intervention upon the individual and the organisation in which they serve. These outcomes (levels) are: 1. REACTION - an assessment of the reaction of a trainee to the training program. This is designed to capture the likes and dislikes of the trainee towards the programme of training. 2. LEARNING – provides quantifiable indicators of the acquisition of competence or learning that has been achieved 3. BEHAVIOUR – addresses the issue of learning transfer, i.e. the extent to which new knowledge, skills and attitudes are transferred to the arena for which they are intended 4. IMPACT – seeks to measure the impact the training has had on organizational goals and objectives The popularity of Kirkpatrick's model is the ease with which the complex process of evaluating training programmes may be attempted: It identifies the pertinent questions, defines the criteria that may be appropriate and simplifies the evaluation process to one driven by outcome. It also prompts an examination of multiple measures of training effectiveness (the four levels) and draws attention of the evaluator to the importance of learning transfer in making training effective. The Kirkpatrick model provides a systematic way of addressing training evaluation through a

Task		Progress, Results and Achievements during Reporting Period
		straightforward language of outcomes and information that needs to be assessed. Its use for evaluating standalone training interventions, such as that envisaged in the TeamSafety project is therefore valid and suitable and thus it is this model that underpins the evaluation methodology developed for the TeamSafety project: TECAT. **Training Evaluation Critical Analysis Tool (TECAT)** SBT provides the opportunity for both instructor and simulator to replicate a working environment in which KSAs can be acquired amongst trainees. Being able to measure, track and assess performance within that environment as well as formulate remedial feedback and account for factors that may affect the outcomes is critical to ensuring that training is systematic. It can be seen then that SBT encompasses a summative *and* formative approach to assessment, this being reflected in the elements of TECAT, shown in Figure 1.1. TECAT is designed to assess the TeamSafety product, both as a new technology and as a training intervention for seafarers. It brings together the key features of existing evaluation models and best practices in SBT and combines them with sector specific knowledge to achieve a unique methodological framework for evaluation.

Task		Progress, Results and Achievements during Reporting Period
		 **Figure 1.1** - **A methodology for assessing the effectiveness of the TeamSafety concept** Five key surveys or processes have been identified within this framework that each capture the quantitative and qualitative data required to provide proof of concept and assess the effectiveness of TeamSafety training. These processes each comprise one or more data capture techniques that NI will use to make evidence based judgements. These include: survey, focus group, observation checklists, audio/video recording, self-reporting, peer review, automatic data acquisition (ADA) and 360^{o} feedback. TECAT Survey 1

Task		Progress, Results and Achievements during Reporting Period
		Stage 1 comprises a stakeholder survey, designed to ascertain the attitude and opinion of three key maritime stakeholder groups on the use of 3D Virtual Reality platforms in maritime education and training (MET) today. Not only will the results and key findings of this survey guide project partners with development of the prototype, but the results may be compared with the perceptions of trainees *after* training is complete to establish if the views of stakeholders are in fact realised. TECAT Survey 2 Divided into two sub surveys (2a and 2b), the purpose of these surveys is to ascertain the awareness and motivation of trainees for TeamSafety training before it is introduced. Survey 2a is a pre equipment survey that seeks to acquire the views of trainees towards the use of 3D virtual simulation for the training of non-technical skills. In essence, this survey accords with TECAT survey 1, which is completed by unknown individuals belonging to 3 industry stakeholder groups. In addition, survey 2a seeks to determine whether the trainees have received any prior teaching/training on the topics addressed by the TeamSafety and their perceived view on what successful training in the domain of resource management may hinge upon. Survey 2b is a pre exercise survey that seeks to ascertain the first impression trainees who have been familiarised with TeamSafety gameplay. It probes trainees to consider the realism of the virtual environment, the aims of the training exercise, the roles they fill as participants, the ease with which communications are handled, the human machine interface and quality of the instructor intervention. Gleaning this information will help to unveil the preposition of trainees and any barriers that they may have set for themselves which inhibits the learning outcomes from being achieved. (Note that Survey 2a is a onetime survey, while 2b is repeated before each exercise is carried out). A summary of the questions for this survey may be found in **Annex II** to this report. Data Capture / Auto Data Capture A number of 'best practices' have been published by Salas and Rosen (2007) with respect to capturing and

Task		Progress, Results and Achievements during Reporting Period
		measuring performance in SBT. These practices translate directly to the TeamSafety project and thus their application is outlined below each practice in *italics*. Define the competencies that underlie effective performance and targeted for acquisition – the 'what' that is being trained. *TeamSafety training is designed to train the high level resource management skills of seafarers, mandated by the requirements of the IMO STCW convention for leadership and team working training. These competencies are depicted as 'skill categories' (i.e. task management, team working, situation awareness and decision making) and further distilled into 'skill elements' (i.e. planning, prioritising & maintaining, identifying and utilising resources, exchanging information, authority/assertiveness, supporting others, recognises & anticipates, identifies & evaluates). Descriptions of these skills and how they apply in the maritime context are also defined.* Translate the competencies into measurable learning outcomes – the criteria by which the success of the training programme can be assessed *The TeamSafety platform is designed to simulate real life scenarios on board ship, in which trainees may develop targeted competencies. The virtual scenarios will illicit opportunities for trainees to exhibiting specific overt behaviours akin to the learning outcomes. These appear as 'events' on the rater's checklist.* Develop behavioural markers of performance for each learning outcome - descriptions of good or poor performance, i.e. the presence/absence of targeted competencies *For each learning outcome (event), performance descriptors for the skill element(s) are defined. Independent raters (NI) are then assigned to observe and rate trainee performance against these descriptors based on the overt behaviours (decisions, orders, actions etc.) witnessed.* Develop metrics that are diagnostic of performance - determining the causes of effective and ineffective performance

Task		Progress, Results and Achievements during Reporting Period
		Diagnosing performance is not just a task for subject matter experts. TeamSafety software itself is capable of automatic data acquisition (for example: discrete polling, time lining etc.) which will enrich the data sources and reliability of assessment made by Instructors and raters. Use multiple data sources and types to capture performance *In addition to the above, self-reporting and peer review are powerful mechanisms for trainee feedback and performance assessment; hence the TeamSafety software as part of TECAT will exploit these evaluation techniques.* Capture individual and team performance – multi level analysis *Observed.* Capture processes and performance outcome – ascertain mission success but also capture the processes of performance that led to that success *The rater's checklist divides the virtual scenario into distinct events that may each be analysed on conclusion of an exercise. It is therefore possible that the mission set for trainees in the virtual environment may fail but the processes that led to that failure were correctly followed.* Integrate all of the performance measurements – for a consistent and balanced assessment *Observed* Maintain a good ratio of instructors to trainees *Observed.* The 9 best practices above were followed in devising a 'rater's checklist' which is designed to capture, measure and assess the performance of trainees during training. An example is shown in **Annex V**.

Task		Progress, Results and Achievements during Reporting Period
		TECAT Survey 3 Divided into two sub surveys (3a and 3b), the purpose of these surveys is to gauge the reaction of and learning realised by the trainees who have participated in TeamSafety training. Survey 3a provides a mechanism for reflection on the activity undertaken in the virtual environment *before* the Instructor debrief is carried out. Soliciting feedback at this stage is meaningful as it avoids trainee responses being tainting or influenced by the presence of peers or the responses of instructors. This survey is repeated after each exercise. Survey 3b enables the trainee to anonymously challenge any misalignment between feedback received from the instructor and the self-assessment carried out by them. In this survey, overall impressions of the platform may be disclosed and comments on the training exercise made. A summary of the questions for this survey may be found in **Annex III** to this report. TECAT Survey 4 This one time survey seeks to capture the reaction to the learning in the trainee following TeamSafety training. Questions relate to delivery, technology, feedback and learning potential. It recalls the first two levels of Kirkpatrick's training evaluation model; reaction and learning. Trainees are provided with an opportunity to reflect on the training programme as a whole and the discoveries they have made in the fields of virtual simulation for resource management training. It enables trainees to offer frank opinions on the effectiveness of the platform as a training tool and of the training intervention overall. A summary of the questions for this survey may be found in **Annex IV** to this report. TECAT Survey 5 This survey establishes through reflective statements and supporting evidence, the behavioural change in the trainee that has resulted from TeamSafety training. It recalls the third level of Kirkpatrick's evaluation model; behaviour. The survey aims to make an assessment of the KSAs acquired in training which may be transferred to the workplace of the trainee. In many regards this survey may be considered the most critical part of TECAT since it is

Task		Progress, Results and Achievements during Reporting Period
		designed to evidence the impact on behaviour which has resulted from training. In other words the improved resource management practices of trainees subjected to Teamsafety training. **TeamSafety Training and TECAT Trials** For prototype testing purposes, 4 experienced seafarers were requested to be assembled to be made familiar with the TeamSafety software and general game play. They would be instructed by the SMEs in the aims and objectives of the exercise and the role they would fill in that exercise. SMEs agreed that a 30 minute exercise involving a vehicle fire on the car deck of the Ro-Ro passenger ferry modelled would provide the scenario in which to train and assess the desired competencies. NI accepted its role as an independent rater of the intervention. TeamSafety project partners agreed to conduct TeamSafety trials on Wednesday 10th October 2012 at World Maritime University, Malmo, Sweden. For this occasion, 6 postgraduate students of mixed nationality would be invited to become trainees in one exercise and receive instruction from SME partners. The Trainees It was agreed between consortium partners that a knowledge and understanding of general ship layouts, shipboard hierarchies and the practice of seamen was a vital pre requisite for any trainee undertaking TeamSafety training. It was therefore requested that WMU students should have seagoing experience and have sailed as a qualified deck officer if they were to be invited to become TeamSafety trainees. It was also requested that, as a minimum, trainees should be made available for at least one whole day. Imposing such prerequisites would achieve several aims: 1. Instructors would not be time burdened having to explain basic nautical terminology, ship layouts etc. 2. The process of responding to an incident at sea, knowing of and utilising available shipboard resources would already be a familiar concept 3. The theory of resource management would already be known 4. The higher level competencies that TeamSafety is designed to train could be immediately targeted

Task		Progress, Results and Achievements during Reporting Period
		The Training To replicate a shipboard environment as closely as possible, it was requested to separate the command and control team (3 trainees) based on the virtual bridge from the on-scene commander (1 trainee) who would act as their eyes and ears at the scene of an incident. Thus two adjacent rooms were used in WMU to prevent visual and verbal clues influencing the trainees who, in the real world, would not physically see or hear each other. With 4 trainees in place, two consecutive training exercises were carried out each of about 30 minutes duration. Each trainee filled a predefined role, the functions of which were explained to them. These roles were: Captain, Staff Captain and Office of the Watch (in room 1) and On Scene Commander (in room 2). For both exercises, NI raters were stationed in room 1 to observe trainees on the bridge while video recording equipment was stationed in room 2 to capture the performance of the On Scene Commander. By independently tracking and assessing trainee performance either as it happened or via video playback, the raters were able to alleviate some of the subjective bias associated with traditional instructor feedback and agree on the ratings awarded through a process of moderation. **Applying TECAT** The Findings of TECAT are presented in accordance with the elements depicted in Figure 1.1. <u>TECAT Survey 1</u> The key findings of this survey, conducted in January 2012 with 191 persons are summarised below: • There was overriding support for the development and introduction of 3D virtual reality training in maritime education and training • It was generally felt that virtual simulation must supplement not supplant traditional 'hands on' training. The term blended learning approach was quoted on several occasions. • It was held that the platform must be well designed with an ease of use that allows the trainee to focus on the training not the technology. This accords with the need for a thorough familiarisation period for the

Task		Progress, Results and Achievements during Reporting Period
		trainees to overcome difficulties in usability. • The scenarios must be realistic and an instructor must be in place to ensure training does not become 'gaming'. It was considered that the best judges of realism would be trainees themselves who, depending on their expertise in the field, would attach their own fidelity rating to the platform. • The platform must be able to replay and rerun exercises multiple times to enable trainees to reflect and learn – a powerful feature of the simulator • The level of the trainee and the type of training must be a carefully matched or else learning opportunity is lost A summary of the questions for this survey may be found in **Annex I** to this report. <u>TECAT Survey 2</u> Overall the trainees selected were supportive of 3D virtual simulation as a tool for training resource management skills. Half of them indicated that they had never experienced this type of training in the past. Being receptive to new technologies and showing a willingness to embrace them, particularly when they feature so prominently in training, is a barrier that must be overcome if trainees are to meet with any success in SBT. The impressions made upon the trainees before training commenced was generally positive. Favourable comments were made regarding the simple human machine interface and fidelity of the virtual environment. However negative comments regarding the mode and quality of voice communications between trainees were made. There was also a general feeling that familiarisation with the ship layout and 'where things were' was difficult to achieve in such a short session. <u>Data Capture / Auto Data Capture</u> For prototype testing, a scenario was created in the virtual ship to which the trainees would respond. Observing the trainees in their training were two independent raters from NI whose task it was to link observable behaviour to the performance descriptors of the competencies being assessed. Through a process of moderation the raters could then agree on the merits of the performance of trainees and compare it with instructor feedback and self-assessment of the trainees.

Task		Progress, Results and Achievements during Reporting Period
		The checklist used by the raters is shown in **Annex VI**. TECAT Survey 3 It was apparent at this stage of the trials that the trainees were cognizant of the purpose of TeamSafety training, but that their unfamiliarity with the ship type and the roles they each filled prevented them from giving a strong performance. Notwithstanding, they generally felt engaged in the exercise and enthusiastic of the platform. Technical glitches with the communication server were experienced and this shortcoming frustrated the trainees throughout. The trainees expressed their support for TeamSafety training for the purpose of practicing emergency procedures. Being able to carry out emergency duties in a senior role in a simulated environment was considered extremely valuable. However, not being ordinarily based at sea or versed with emergency procedures for the roles assumed, the trainees struggled with the process of responding to the events that were triggered during the exercises; they were reactive in dealing with incidents and carrying out necessary checks, rather than proactive in implementing control measures and mitigating risk. The trainees felt that that not enough time was devoted to their induction of the roles they would fill and the ship they would virtually operate in. Finding locations on board and utilising virtual equipment was a struggle. Despite these shortcomings, the trainees did feel immersed in the shipboard environment and sensed the urgency to tackle the fire triggered on the vehicle deck. There was a genuine devotion to work together to overcome the situation they were presented with even though the procedures following and resources used were questionable. TECAT Survey 5 Due to the constraints on time imposed by the TeamSafety project, it was not possible to implement this TECAT stage 5. **TECAT Findings** The TeamSafety training and trials were conducted at a single location, on a single day with a single group of trainees. Having access to a variety of trainees, in a variety of settings with more time for observation and

Task		Progress, Results and Achievements during Reporting Period
		interviewing would have further validated or disproved the conclusions drawn in this report. Conducting a single round of trials on a single occasion with a single sample of students has provided the benchmark against which data from further trials could be compared; however this was possible within the confines of this project. The students provided as trainees for TeamSafety trials were selected on the basis on their knowledge and experience of shipping operations. However, it became apparent through the process of applying TECAT that some of the trainees were unfamiliar with the concepts and theories that underpin resource management training. This immediately disadvantaged the endeavour of the trials as trainees struggled to understand the meaning and significance of the skills and competences they were called upon to develop. Thus, the experience and qualifications of trainees was not entirely suited to the skill level of training that the TeamSafety platform was principally designed for. Resource management training courses are typically conducted over 3 or 4 days to allow trainees to experience a blend of theory and practical based exercises. Most often classroom based sessions are followed by practical simulator based training sessions where theory is consolidated through simulated exercises. During the TeamSafety trials, students were made available for such limited time that a complete programme of training could not be delivered. Moreover, for the time that the trainees were available, every moment was spent on practical exercises rather than the theory that underpins human performance. Again due to timing constraints, SME Instructors were unable to fully familiarise themselves with the TeamSafety platform or the objectives of the exercises they were responsible to lead. Adding to this setback was several technical glitches throughout their familiarisation period which impeded their progress to reach a level of proficiency as an Instructor. **Conclusion** The TeamSafety platform demonstration was successful in that the students, observers and instructors were impressed with the ability to simulate a realistic and stressful bridge environment where communication with an ‘on scene commander’ and simulated shore based roles could be used to refine emergency response techniques.

Task		Progress, Results and Achievements during Reporting Period
		During the trials, due to the limited development of the prototype, interaction with the ship, equipment and other avatars was less than realistic and would benefit from further refinement particularly in response to user feedback. The single day of trials didn't allow for a thorough test of the TECAT methodology and in particular didn't test its ability to measure the retention of learning over a longer periods. This however can not be realized in the frame of a two-years research and technical development project. However, valueable baseline data were produced and provided for ongoing long-term investigation of the training effectiveness as well. TeamSafety does however have the potential to improve the provision of training for emergency response teamwork, leadership and communication beyond anything currently available in the maritime industry.
5.5	Risk assessment WP5	This was an on-going activity throughout the project to identify risks both to the relevant work package and to future work packages. These risks were then reviewed and action plans agreed where required.

Work Package 6 Summary – Innovation, dissemination and training

The Objectives for Work Package 6 are:-

- Project results formulated/compiled into a protectable form included patents.
- Develop an Exploitation Strategy, protection of the Intellectual Property Rights arising from the technological developments in the project.
- Disseminate the generated project knowledge to all the beneficiary's.
- Prepare articles to journals and press release, as well as papers for participation in conferences and exhibitions.
- Make patent searches and if required carry out patent applications.
- Create case study parts and design tools to enable the beneficiary's to quickly absorb the developed technology.
- Broadcast to a much wider audience videos, CD ROMs, web based activity and e-seminars.

Deviations from Annex 1 are:-

No deviations identified.

Task		**Progress, Results and Achievements during Reporting Period**
6.1	Protection of IPR	**This is 100% complete**

Task		Progress, Results and Achievements during Reporting Period
6.2	Knowledge absorption by proposers	**This is 100% complete**
6.3	Dissemination of Knowledge	**This is 100% complete**
6.4	Socio-economic aspects	**This is 100% complete**
6.5	Development of the Exploitation Strategy	**This is 100% complete**
6.6	Uptake of the technology through Training Activities	**This task is 100% complete**

4 Project Management during Period 2

Consortium Management tasks and achievements

The negotiation of the TeamSafety project was successfully achieved: the Grant agreement was issued and signed and the Annex I was finalised on the 20th October 2010.

A financial tool to record partner's time and costs has been used for the project. This has enabled the consortium to monitor the project costs effectively and ensure that all records and documents were stored in the correct method.

Problems which have occurred and how they were resolved or envisaged solutions

No problems have occurred during the project.

Changes in the Consortium

During period 1 of the project, the parent company of DII is Pera Innovations Ltd. Pera completed a long term management review of its whole operational structure to ensure it continued to deliver cost effective and innovative research. As such the structure of DII changed and now utilises the research resource capabilities of its parent company.

Having reviewed the expertise and facilities offered within Pera, specifically its Intelligent Systems Research Institute (ISRI), it was felt that ISRI would be the most appropriate resource to undertake the remaining DII obligations on TeamSafety.

ISRI has significant expertise in the fields of:

- Software development, with specific experience of voice analysis and speech recognition software.
- Electronic hardware design and manufacture.

The consortium members were consulted during this process and no issues or objections were raised. The change over date from DII to ISRI was the 31st March 2011 and has been covered by a contract amendment.

This has now been fully implemented.

List of Project Meetings

During the second period of the project, the following project meetings have been held:-

Month 9 at SSS in Dublin, UK (24 & 25/8/2011)

	WMU	**Unity**	**NI**	**Ask Safety**	**SSS**	**BMTC**	**ISRI**
Attendance	√	√	√	√	√	√	√
Details	See Deliverable 8.1.2						

Month 12 at the REA in Brussels, Belgium 10/11/2011)

	WMU	**Unity**	**NI**	**Ask Safety**	**SSS**	**BMTC**	**ISRI**
Attendance	√	√	√	√	√	√	√
Details	See Deliverable 8.1.2						

Month 16 at Pera, Melton Mowbray, UK (29/02/2012 – 01/03/2012)

	WMU	**REA**	**Unity**	**NI**	**Ask Safety**	**SSS**	**BMTC**	**ISRI**
Attendance	√	√	√	√	√	√	√	√
Details	See Deliverable 8.1.2							

Month 20 at BMTC, Varna, Bulgaria (19/06/2012 – 20/06/2012)

	WMU	**Unity**	**NI**	**Ask Safety**	**SSS**	**BMTC**	**ISRI**
Attendance	√	√	√	√	√	√	√
Details	See Deliverable 8.1.2						

Month 23 meeting at ISRI, Melton Mowbray, UK (19/09/2012)

	WMU	**Unity**	**NI**	**Ask Safety**	**SSS**	**BMTC**	**ISRI**
Attendance	√	√	√	√	√	√	√

Details	See Deliverable 8.1.2

Outside of the formal reviews there have also been a number of technical teleconferences. These have been held at appropriate points to progress specific aspects of the requirements, design and or interfaces. The meetings were well supported by the consortium members.

These meetings were facilitated using Go-To-Meet telephone/on-line conferencing provided by ISRI.

Technical teleconference meetings were held on the following dates:-

21/05/2012

27/06/2012

02/08/2012

15/08/2012

17/08/2012

Further teleconferences were held to discuss dissemination and exploitation on the following dates:-

13/06/2012

03/09/2012

12/10/2012

On board data collection meeting held 18-20/08/2011

5. Development of the TeamSafety project website

A website dedicated to the TeamSafety project was established early in the project life, by Month 3, see http://www.team-safety.eu/

The website was used to pass information to all the beneficiaries and includes useful information and details, such as:

- Overall description of the project
- Details of the Project Partners
- Meetings
- File Store, containing:
    1. Contractual Information

2. Presentations
3. Deliverables
4. Meeting details and Presentations
5. Contains Logos

All commercially confidential information is stored in a part of the website that is secure, access given by username and password. All consortium members have usernames and passwords.

Website screen images are shown overleaf.

In addition to the developed website, a TeamSafety logo has been developed to put an identity to the project. This image is shown below, and is available on the website for beneficiaries to use.

Use of foreground and dissemination activities during the reporting period

The TeamSafety training system is the first merchant navy training technology that provides effective strategic emergency decision making, communication and leadership training for officers and crew of passenger ships. In particular, the training system can simulate the impact of panic caused by environmental stress factors like fires, communication and decision making behaviours. No current available system can do this (Section **Error! Reference source not found.**). The recent Costa Concordia disaster is expected to bring about an amendment of maritime safety regulations and in particular a requirement of ship operators to provide evidence of the emergency capabilities of crews operating passenger vessels (Section **Error! Reference source not found.**). For this reason the TeamSafety technology is addressing an increasingly urgent need within the passenger ship industry and several potential partners, including DFDS, Norwegian Oil and Gas and Start Oil have expressed interest to further develop the technology (Section **Error! Reference source not found.**).
A trial demonstrated that TeamSafety has the potential to improve the provision of training for emergency response teamwork, leadership and communication beyond anything currently available in the maritime industry (Section **Error! Reference source not found.**).
Due to the nature of the TeamSafety technology, the offering addresses the needs of marine safety training on ships, in particular passenger ships and on oilrigs. It is estimated that the total value for safety training in these market segments is in the order of 350 million Euros (Section **Error! Reference source not found.**).
Please refer to Deliverable 6.2b for further details.

No	Type of Activities	Main Leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Website	D.Patraiko M.Baldauf G.Wright	TeamSafety website www.team-safety.eu	Ongoing	Internet	Mixed	Very large	Europe and worldwide
2	Conference presentation	M.Baldauf (Co-author)	"Advanced Maritime Simulation …"	March 13-15, 2011	Texas A & M University at Galveston and Texas Maritime Academy, Galveston, TX	Maritime Education Summit: The Way Forward	large	U.S. and worldwide
3	Paper presentation at Conference	M.Baldauf (Co-author)	New Simulation Technology for Safety and Security Training in MET.	June 12-14, 2011	Gdynia, Maritime University	IAMU Annual General Assembly (AGA12)	large	Europe and worldwide
4	Presentation	S. Gosling	Serious Gaming	March 2012	Massachusetts Maritime Academy (US)	Educators	Large	USA & Europe
5	Presentation	D. Patraiko	Advanced Maritime Simulation	April 2012	Riga, Latvia	International Association of Sea Survival Trainers	Large	Europe and Worldwide
6	Presentation & Paper	S. Gosling	Serious Gaming	April 2012	Singapore	International Maritime Simulation Conference	Large	Worldwide

						(MarSim)		
7	Presentation	M. Baldauf	Learning objective oriented scenario des	June 2012	Spain	International Maritime Transportation	Large	Europe and Worldwide
8	Paper & Presentation	S. Gosling	Serious Gaming	July 2012	Netherlands	International Maritime Lecturers Association (IMLA)	Large	Europe and Worldwide
9	Presentation	M. Baldauf	Computer graphics and Simulation for Maritime Safety	August 2012	Germany	Maritime Stakeholders	Europe	Europe
10	Presentation	M. Baldauf	Team Training in Maritime Safety	Septembe r 2012	Germany	International Navigation Simulator Lecturers' Conference		Worldwide
11	Presentation	S. Brugnot	TeamSafety Results	October 2012	St John's Canada	International Association of Sea Survival Trainers	Large	Worldwide

6. Deliverables and Milestones tables

Deliverables

TABLE 1. DELIVERABLES

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status Not submitted/ Submitted	Comments
1.1	Report on maritime training platforms	WP1	WMU	R	CO	6	30/04/2011	Submitted	
1.2	Descriptive report on Unity game engine architecture	WP1	Unity	R	CO	6	30/04/2011	Submitted	
1.3	Comprehensive report on MPD	WP1	WMU	R	CO	6	30/04/2011	Submitted	

TABLE 1. DELIVERABLES

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status Not submitted/ Submitted	Comments
1.4	SoA report on visual speech recognition	WP1	ISRI	R	CO	6	30/04/2011	Submitted	
1.5	Comprehensive review on PC-HIDs	WP1	ISRI	O	CO	6	30/04/2011	Submitted	
2.1	Crisis scenario methodology design and control report	WP2	WMU	R	CO	12	12/12/2011	Submitted	
2.2	SPH and crisis scenario methodology technical	WP2	Unity	R	CO	16	11/07/2012	Submitted	

TABLE 1. DELIVERABLES

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status Not submitted/ Submitted	Comments
3.1	Technical report on tonal speech recognition algorithms	WP3	ISRI	R	CO	12	2/12/2011	Submitted	
3.2	Technical report on tonal speech recognition and gesture emulation	WP3	ISRI	R	CO	16	27/04/2012	Submitted	
4.1	Technical report on HID approach and architecture development	WP4	ISRI	R	CO	12	30/10/2012	Submitted	
4.2	Report on integration of HID	WP4	ISRI	R	CO	16	23/03/2012	Submitted	

TABLE 1. DELIVERABLES

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status Not submitted/ Submitted	Comments
	and the virtual environment								
5.1	Technical report of Teamsafety maritime content	WP5	Unity	R	CO	20	30/11/2012	Submitted	
5.2	Integration report	WP5	Unity	R	CO	24	7/12/12	Submitted	
6.1	Patent application	WP6	NI	O	CO	24			Included in final dissemination report
6.2a	Interim exploitation and use plan (DUP)	WP6	NI	R	CO	9	15/08/2011	Submitted	
6.2b	Final exploitation plan use plan	WP6	NI	R	CO	24	14/02/2013	Submitted	Revised edition

TABLE 1. DELIVERABLES

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status Not submitted/ Submitted	Comments
	(DUP)								
6.3	Dissemination and exploitation events	WP6	NI	R	CO	20			Included in final dissemination report
6.4	Exploitation Agreement	WP6	NI	R	CO	24			Included in final dissemination report
7.1.1	Delivery of RP1 Report	WP7	WMU	R	CO	9	3/10/2011	Submitted	
7.1.2	Delivery of final report	WP7	WMU	R	CO	24	8/12/2012	Submitted	
7.2	Report in gender, societal and ethical issues of exploitation	WP7	WMU	R	CO	24		Submitted	

TABLE 1. DELIVERABLES

Del. no.	Deliverable name	WP no.	Lead beneficiary	Nature	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status Not submitted/ Submitted	Comments
8.2	Project web site	WP8	ISRI	R	CO	3	31/01/2011	Submitted	
8.2b	Project meeting minutes						7/12/12	Submitted	

Milestones

TABLE 2. MILESTONES							
Milestone no.	**Milestone name**	**Work package no**	**Lead beneficiary**	**Target delivery date from Annex I dd/mm/yyyy**	**Achieved Yes/No**	**Actual / Forecast achievement date dd/mm/yyyy**	**Comments**
1.1	Preliminary TeamSafety full-system specifications	WP1	DII	30/04/2011	Yes	30/04/2011	
2.1	SPH/MPD toolset	WP2	Unity	28/02/2012	N/A	28/02/2012	
3.1	TSR middleware	WP3	ISRI	28/02/2012	N/A	28/02/2012	
4.1	PC-HID middleware	WP4	ISRI	28/02/2012	N/A	28/02/2012	
5.1	Prototype of TeamSafety	WP5	Unity	31/10/2012	N/A	01/10/2012	
6.1	Dissemination and use plan	WP6	NI	31/08/2012	N/A	14/02/2013	(revised after December 2012 review)

Gant Chart – Current Status

Work Package ID	Description		Start Date	End Date	End of Month																	
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 2.1	Design the architecture of the SPH toolset and functional description	*Target*	Apr-11	Sep-11																		
		Actual	Apr-11	Sep-11																		
Task 2.2	Design and develop a middleware component to incorporate the SPH into the game engine	*Target*	Sep-11	Dec-11																		
		Actual	Sep-11	Dec-11																		
Task 2.3	Generate a comprehensive methodology for crisis scenario design and control	*Target*	Oct-11	Feb-12																		
		Actual	Oct-11	Feb-12																		
Task 2.4	Generate and integrate the generated crisis scenario into the SPH	*Target*	Oct-11	Feb-12																		
		Actual	Oct-11	Feb-12																		
Task 2.5	Risk assessment of WP2	*Target*	Jan-12	Feb-12																		
		Actual	Jan-12	Feb-12																		
Del 2.1	Crisis Scenario methodology design and control report	*Target*		Oct-11																		
		Actual		Dec-11																		
Del 2.2	SPH and crisis scenario methodology technical	*Target*		Feb-12																		
		Actual		Jul-12																		

``

Work Package ID	Description		Start Date	End Date	End of Month																	
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 2.1	Design the architecture of the SPH toolset and functional description	*Target*	Apr-11	Sep-11																		
		Actual																				
Task 2.2	Design and develop a middleware component to incorporate the SPH into the game engine	*Target*	Aug-11	Dec-11																		
		Actual																				
Task 2.3	Generate a comprehensive methodology for crisis scenario design and control	*Target*	Oct-11	Feb-12																		
		Actual																				
Task 2.4	Generate and integrate the generated crisis scenario into the SPH	*Target*	Oct-11	Feb-12																		
		Actual																				
Task 2.5	Risk assessment of WP2	*Target*	Jan-12	Feb-12																		
		Actual																				
Del 2.1	Crisis Scenario methodology design and control report	*Target*		Oct-11																		
		Actual		Dec-11																		
Del 2.2	SPH and crisis scenario methodology technical	*Target*		Feb-12																		
		Actual		Jul-12																		

Work Package ID	Description		Start Date	End Date	End of Month																
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 3.1	Develop software-based algorithms for tonal speech recognition (TSR)	*Target*	Apr-11	Sep-11																		
		Actual	May-11	Apr-12																		
Task 3.2	Design and develop parametric middleware to integrate TSR into the game engine	*Target*	Aug-11	Dec-11																		
		Actual	May-11	Apr-12																		
Task 3.3	Develop understanding on human facial expressions and cross reference to TSR	*Target*	Aug-11	Dec-11																		
		Actual	Aug-11	Apr-12																		
Task 3.4	Design and develop a middleware component to emulate on-screen gesture expressions	*Target*	Aug-11	Feb-12																		
		Actual																				
Task 3.5	Rick assessment WP3	*Target*	Jan-12	Feb-12																		
		Actual																				
Del 3.1	Technical report on TSR algorithms	*Target*		Oct-11			◆															
		Actual		Dec-11					◆													
Del 3.2	Technical report on TSP and gesture emulation	*Target*		Feb-12							◆											
		Actual		Mar-12									◆									

Work Package ID	Description		Start Date	End Date	End of Month																	
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 4.1	Design and develop the architecture to integrate PC-HIDs into the gaming engines	*Target*	Apr-11	Aug-11																		
		Actual	Apr-11	Dec-11																		
Task 4.2	Design hardware and software to support HIDs in providing an immersive training simulator environment	*Target*	Sep-11	Nov-11																		
		Actual	Sep-11	Apr-12																		
Task 4.3	Integration of HID hardware and software into the virtual environment	*Target*	Dec-11	Feb-12																		
		Actual	Apr-12	Sep-12																		
Task 4.4	Risk assessment of WP4	*Target*	Jan-12	Feb-12																		
		Actual	Jan-12	Feb-12																		
Del 4.1	Technical report on cross functional mapping between PC -HID and MRTS	*Target*		Oct-11																		
		Actual		Dec-11																		
Del 4.2	Report on PC-HID and MRTS integrated to the virtual environment	*Target*		Feb-12																		
		Actual		Feb-12																		

Work Package ID	Description		Start Date	End Date	End of Month																
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 5.1	Design the TeamSafety maritime content	*Target*	Mar-12	May-12																		
		Actual	May-12	**DEC 12**																		
Task 5.2	Develop specific TeamSafety maritime content	*Target*	May-12	Jul-12																		
		Actual	May-12	Aug-12																		
Task 5.3	Integration of components from WP1-4	*Target*	Jun-12	Oct-12																		
		Actual	Jun-12	Oct-12																		
Task 5.4	Beta Testing and validation	*Target*	Aug-12	Oct-12																		
		Actual	Sep-12	Oct-12																		
Task 5.5	Risk assessment WP5	*Target*	Jun-12	Jul-12																		
		Actual	Aug-12	Oct-12																		
Del 5.1	Technical report on Teamsafety maritime content	*Target*		Jun-12																		
		Actual		Dec-12																		
Del 5.2	Integration report	*Target*		Oct-12																		
		Actual		Nov-12																		

Work Package ID	Description		Start Date	End Date	End of Month																	
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 6.1	Protection of IPR	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 6.2	Knowledge absorption by proposers	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 6.3	Dissemination of knowledge	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 6.4	Socio-economic aspects	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 6.5	Development of the Exploitation Strategy	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 6.6	Uptake of the technology through Training Activities	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Del 6.1	Patent application	*Target*		Oct-12															◆			
		Actual		NA																◆		
Del 6.2b	Final expoitation and and use plan	*Target*		Oct-12															◆			
		Actual		Dec-12																◆		
Del 6.3	Disseminaion and exploitation plan	*Target*		Jun-12																		
		Actual		NA																		
Del 6.4	Exploitation agreement	*Target*		Oct-12															◆			
		Actual		NA																◆		

Work Package ID	Description		Start Date	End Date	End of Month																	
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 7.1	Co-ordination of Knowledge	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 7.2	Co-ordination of Technical Activities at a consortium level	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 7.3	Co-ordination of Legal Aspects	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 7.4	Communication between the consortium and EC	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Del 7.1	Delivery of periodic reports and final report	*Target*		Jan-12																		◆
		Actual		Jan-12																		◆
Del 7.2	Report on gender, societal and ethical issue of exploitation	*Target*		Oct-12															◆			
		Actual		Nov-12															◆	◆	◆	
Task 8.1	Review and management of Project progress	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 8.2	Scheduling and Work Plan change control	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Task 8.3	Co-ordination of technical activities and communication among beneficiary's	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10																			

Work Package ID	Description		Start Date	End Date	End of Month																
					10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
					Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Task 8.4	Provision of minutes taken at meetings	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10																			
Task 8.5	Reviews and management of impact on economical and societal issues	*Target*	Nov-10	Oct-12																		
		Actual	Nov-10	Oct-12																		
Del 8.1	Provision of minutes taken at project management meetings	*Target*		Oct-12															♦			
		Actual		Dec-12																	♦	
Del 8.2	Project website	*Target*		Jan-11			♦															
		Actual		Oct-12																♦		

7. Impact of possible deviations from the planned milestones and deliverables

There were delays to several deliverables. These include:-

- D6.2 - After the final review held in December 2012, it was agreed to revise Deliverable 6.2 and submit by February 2013. This has now been submitted with revisions made.
- D5.1 and D5.2 - Some delays have been experienced with WP5: The nature of the work against WP5 was complex and interdependent. Work on one aspect of the integration often impacted other parts that had already been integrated at an earlier stage, resulting in the need for revisiting those parts of the software to refactor and/or optimise the code or even change features. This made it impractical to write the reports on WP5 before the end of M24 and this is why both D5.1 and D5.2 were delayed compared to the initial deadlines.

The above has since been submitted