



## PROJECT DELIVERABLE REPORT

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**Project Acronym:** X-Scan

**Project Title:**

***Laser guided inspection robot for the Non-Destructive Testing of thin steel gauge welds in the shipping industry***

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**Deliverable title:**

***Project Website***

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## Summary

This document provides an overview of the X-Scan project website [www.x-scan.eu](http://www.x-scan.eu). The domain name, project logo and content have been created after project started on 1<sup>st</sup> October. The website will be used to support dissemination activities and as a database for the project. It will also support the communication between the consortium members. The content of the website will be updated in parallel to the progress.

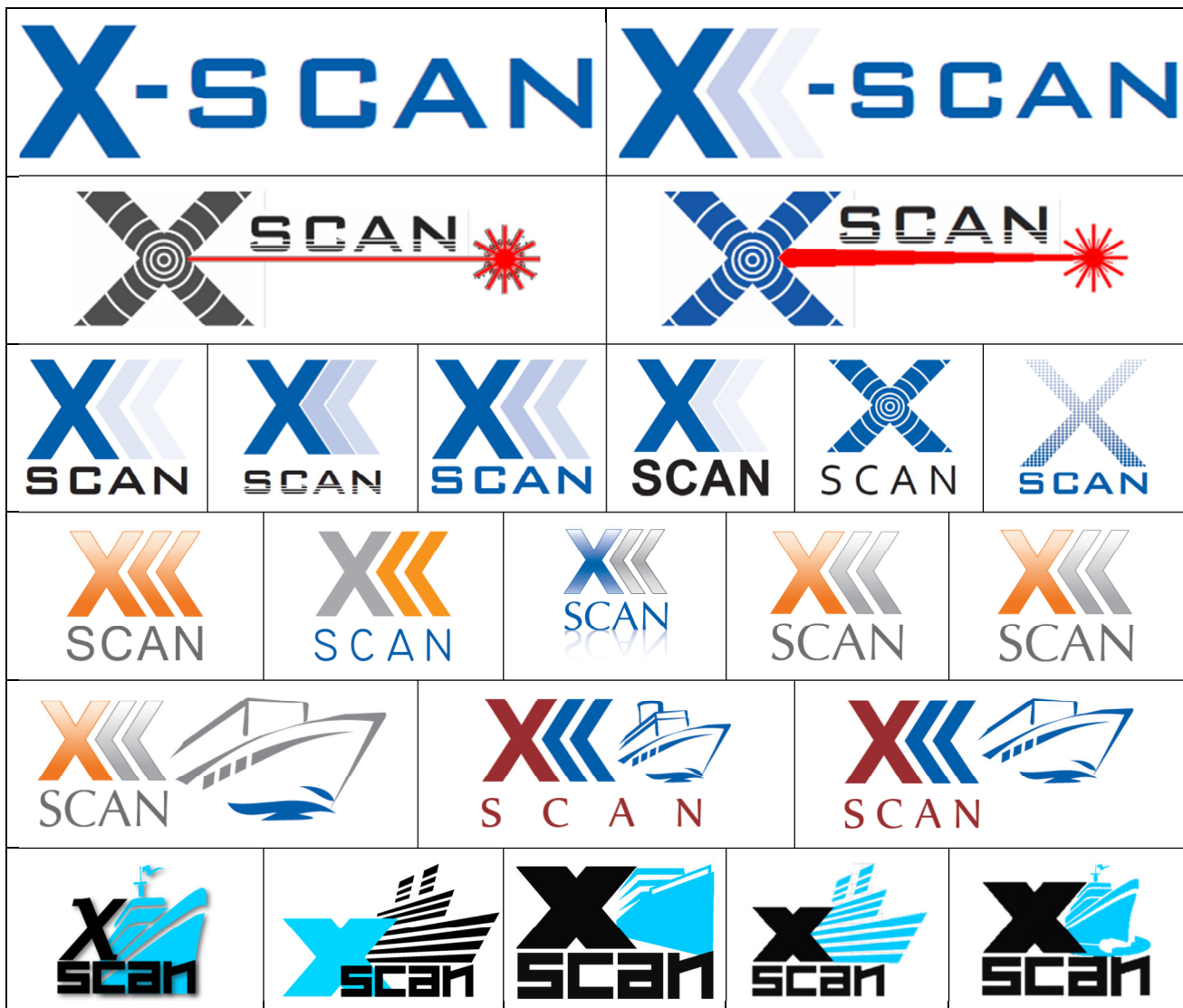
## 1 Domain name

The domain name for the project was created and registered within the first few weeks following the project starting date. This domain is [www.x-scan.eu](http://www.x-scan.eu) and is available for an initial period of three years until the end of September 2014. The plan is to use the website as a dissemination tool after the completion of the project allowing members of the consortium to publicise the results obtained and research carried out throughout the work programme.

## 2 Project logo

Prior to any website development, the consortium decided to concentrate on creating a logo for the project which will be used in all documents related to X-Scan. This logo will also act as the brand for the product(s) to be developed within the project.

TWI developed some samples of logo which were then circulated to the consortium for feedback and comments. Those are presented in Figure 1.



**Figure 1** First set of logo samples.

Ultimately, it was decided that the most suitable logo for the project was the one presented in Figure 2. The project logo will be used on the website as well as all project related documents (i.e. flyer, publications) and the deliverable reports in order to support the dissemination activities.



**Figure 2** Project logo.

### **3 Project website overview**

The project website was built within the first three months of the project to facilitate the dissemination and act as a communication tool for the consortium. The site content is as follows:

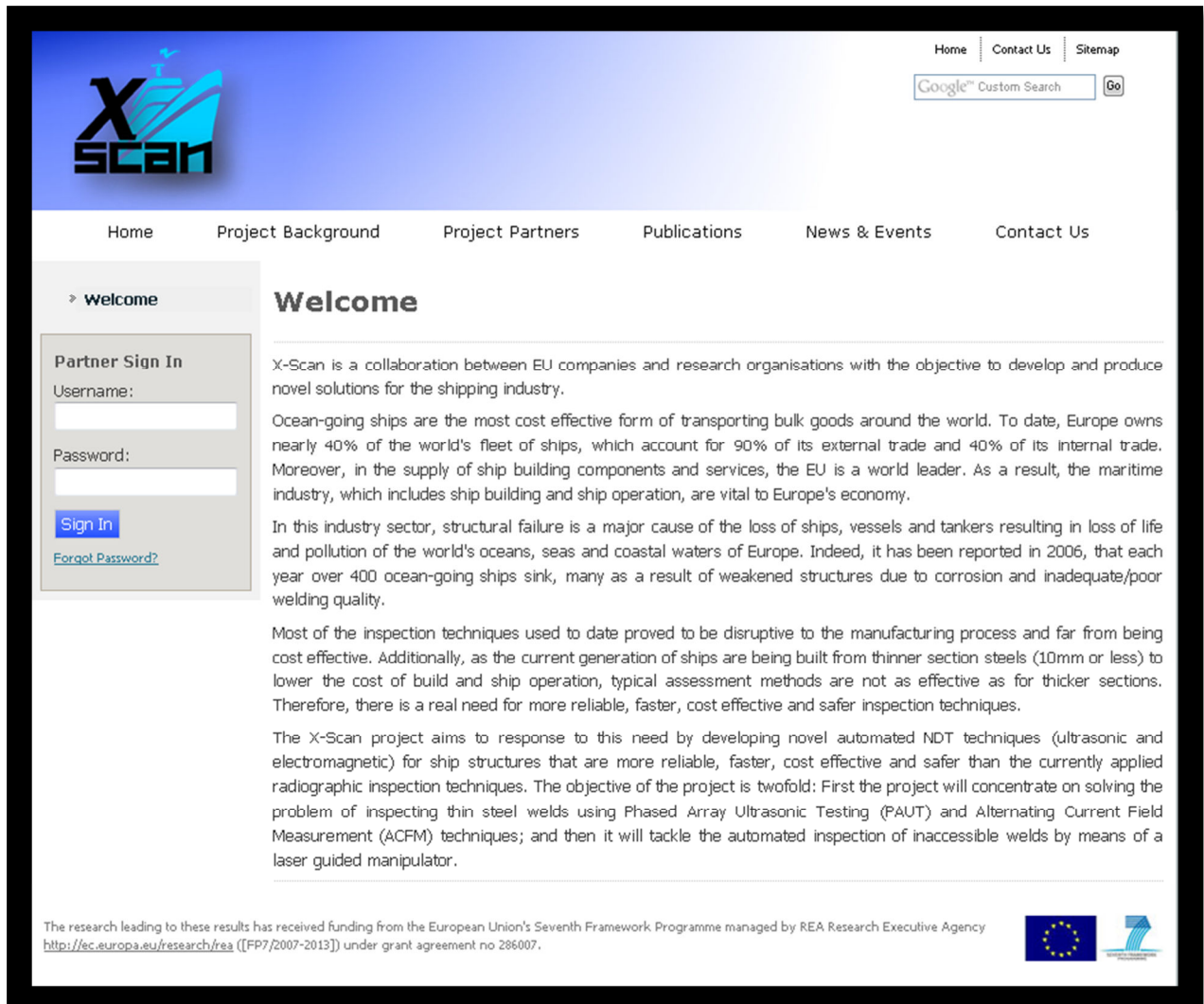
#### **Public facing area**

- Home
- Project Background
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  - Tecnitest
  - Vernon
  - Spectrumlabs
  - Lloyds
  - Brunel University
  - Innora
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- Contact us

#### **Members Area (members only)**

- Noticeboard
- Project files
- Partner contacts
- My account
- Sign out

Figure 3 below presents the project website homepage which welcomes the viewers with some background information on the project and an overview of the consortium intentions for the technical development throughout the work programme.

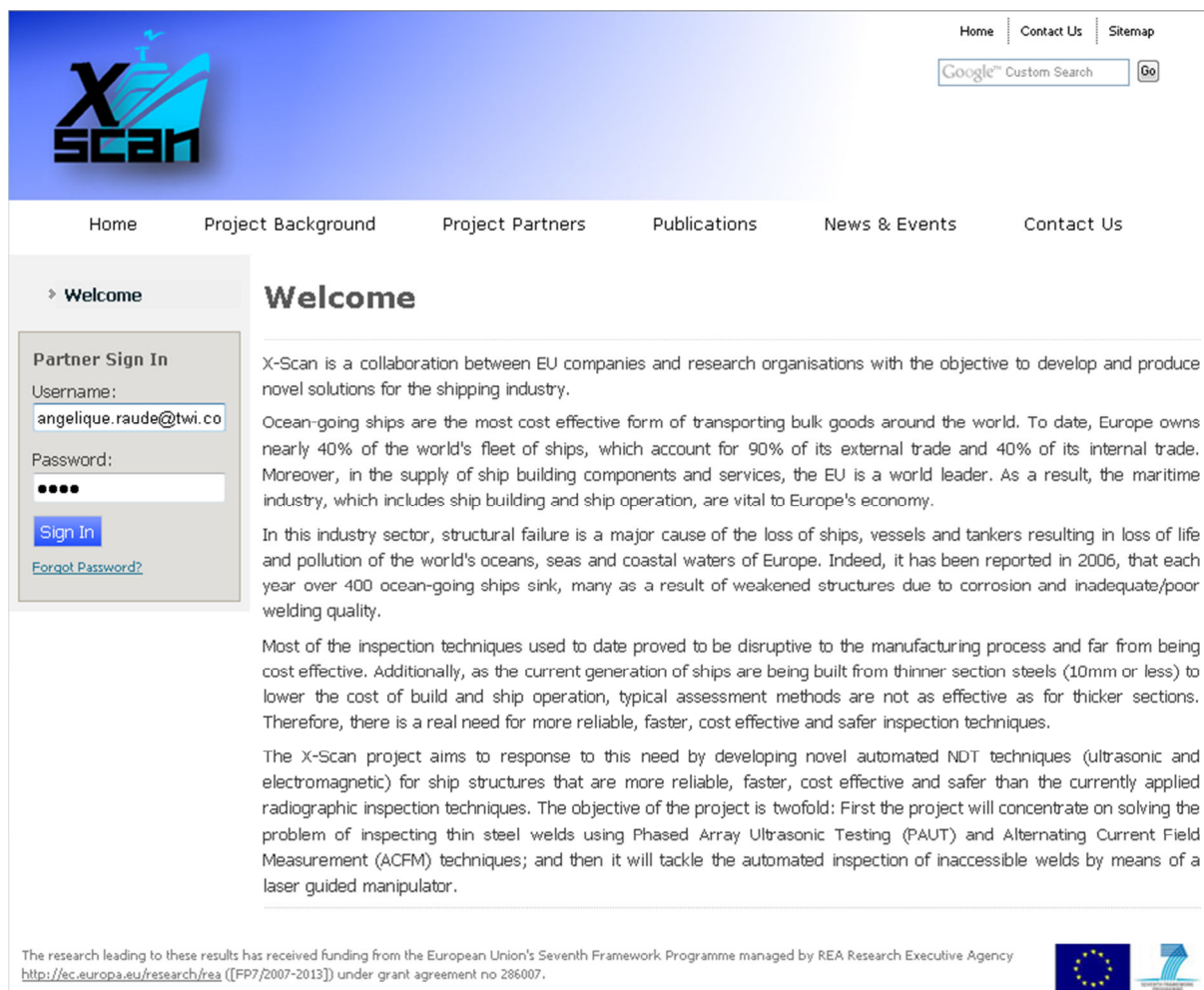


**Figure 3** Screenshot of the X-Scan project website homepage.

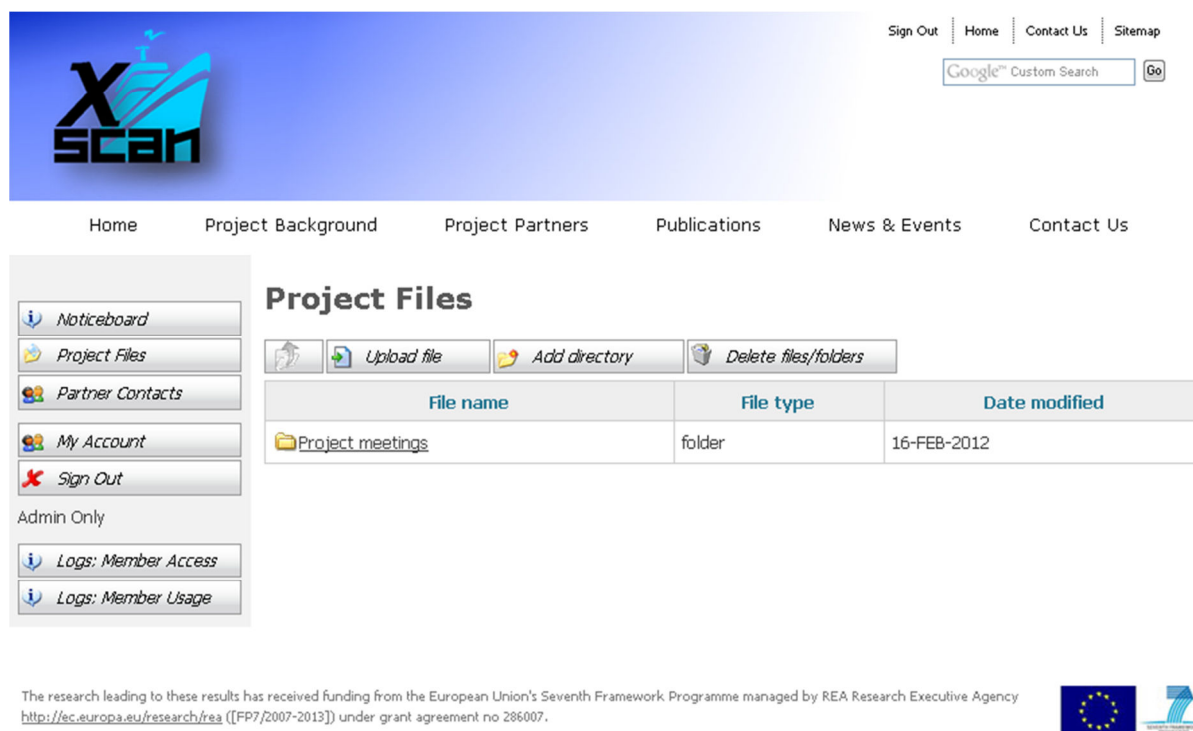
The website is divided into two main areas: one accessible for the public and one only accessible by the member of the consortium.

**The public area:** The public area gives an overview of the project and explains the goals of the consortium during the work programme. There is also an introduction of all companies who participate in the project, along with links to their respective websites. The relevant project activities and some of the results will be publicised on the website as soon as they become available. All results to be published on the website will be reviewed and agreed by the entire consortium prior to being uploaded in order to protect intellectual property rights (IPR). This part of the project website will be used as a tool for the project dissemination and exploitation.

**The members' area:** This area is password protected and it can only be accessed by members of the consortium from the Homepage (see Figure 4). The consortium members will have online access to all meeting agendas, presentations and minutes as well as the reports produced during the project period (see Figure 5). All documents and papers that are relevant to the project will also be uploaded onto the website for member use. The template documents and spread sheets such as travel log, events log and end user log will be shared via the project website.



**Figure 4** Screenshot showing access to the members' area.

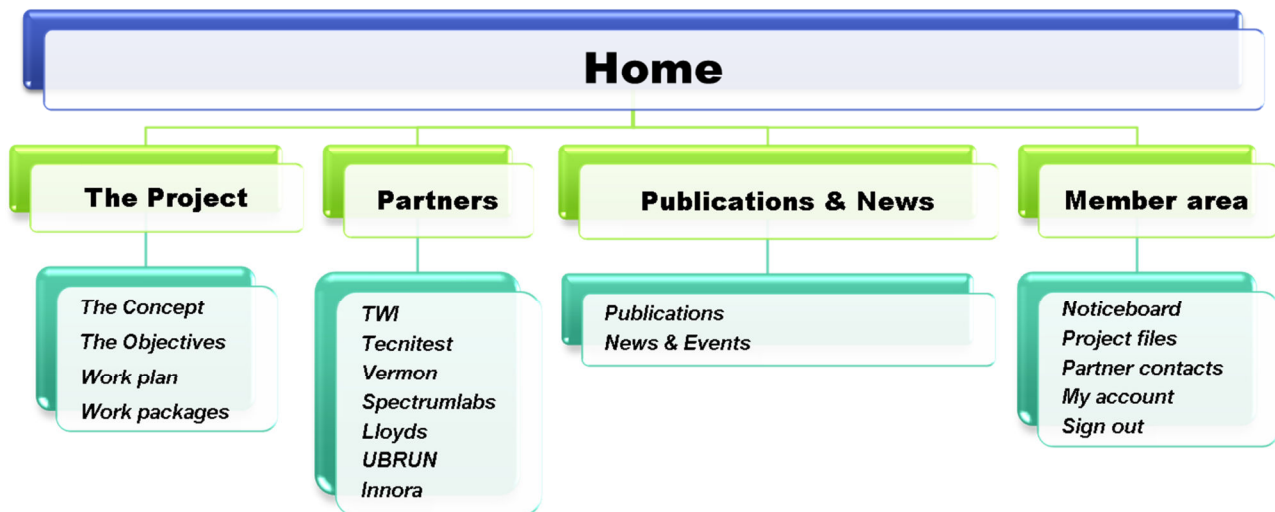


**Figure 5** Screenshot showing members' area.

## 4 Planned updates and activities

### 4.1 Main website structure

It is planned to slightly change the site content to make better use of it. Figure 6 shows the new version proposed. The main changes will be made to the “Publications” and “News & Events” areas which will now be compiled into one section called “Publication & News”. Additional information will also be added to the project description.



**Figure 6 Schematic presenting the next project site content.**

### 4.2 Website design

The website design is being reviewed and a more appealing version currently under development and will be made available for March 2012. Images will be added to the main directory and those will be updated as the project goes on.

The full new website design is presented in Appendix A.

Finally, it should be noted that the consortium is planning to use this website as a communication tool to the public and will therefore ensure regular updates and upgrades are being made.





## Laser Guided inspection robot for the non-destructive testing of thin steel gauge welds in the shipping industry

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### Welcome

#### ➤ Welcome

X-Scan is a collaboration between EU companies and research organisations with the objective to develop and produce novel solutions for the shipping industry.

Ocean-going ships are the most cost effective form of transporting bulk goods around the world. To date, Europe owns nearly 40% of the world's fleet of ships, which account for 90% of its external trade and 40% of its internal trade. Moreover, in the supply of ship building components and services, the EU is a world leader.



As a result, the maritime industry, which includes ship building and ship operation, are vital to Europe's economy.



In this industry sector, structural failure is a major cause of the loss of ships, vessels and tankers resulting in loss of life and pollution of the world's oceans, seas and coastal waters of Europe. Indeed, it has been reported in 2006, that each year over 400 ocean-going ships sink, many as a result of weakened structures due to corrosion and inadequate/poor welding quality.

Most of the inspection techniques used to date proved to be disruptive to the manufacturing process and far from being cost effective. Additionally, as the current generation of ships are being built from thinner section steels (10mm or less) to lower the cost of build and ship operation, typical assessment methods are not as effective as for thicker sections. Therefore, there is a real need for more reliable, faster, cost effective and safer inspection techniques.

The X-Scan project aims to response to this need by developing novel automated NDT techniques (ultrasonic and electromagnetic) for ship structures that are more reliable, faster, cost effective and safer than the currently applied radiographic inspection techniques. The objective of the project is twofold: First the project will concentrate on solving the problem of inspecting thin steel welds using Phased Array Ultrasonic Testing (PAUT) and Alternating Current Field Measurement (ACFM) techniques; and then it will tackle the automated inspection of inaccessible welds by means of a laser guided manipulator.

The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA Research Executive Agency <http://ec.europa.eu/research/rea> (FP7/2007-2013) [FP7/2007-2011] under grant agreement no 286007.



**Figure 7** Mock-up of the new project website design under development.

**APPENDIX**

**NEW DESIGN PROPOSED**





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### The Objectives

The project will enable significant technological progress to be made in a challenging area that has seen little development work to date. The new ultrasonic system will provide direct imaging and analysis at much greater convenience and speed than currently exists.

Strategic Objectives Addressed

- To increase scientific understanding of the transmission of phased array generated ultrasonic waves in thin plate materials and welds
- To increase scientific understanding of the interaction of ACFM generated fields with defects in thin plate weld materials
- To develop an automated inspection system for thin steel gauge weld, consisting of:

- An optical sub-system
- A PAUT sub-system
- An ACFM sub-system

A prototype manipulator combining the three sub-system in one unit


To validate the final prototype by carrying out laboratory and field trials.

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## Work Plan

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- **Work Packages**

The X-Scan project is industry driven and TWI is leading the project because of its experience, both technically and in project management. The consortium has the responsibility for the success of the project and has therefore organised the work activities into a number of discrete Work Packages. The project is divided into a data acquisition and design phase and the implementation phase. Each work package (WP) will be led by the listed partner, and TWI is responsible to maintain an overview and to ensure that the WP administration and the milestones are achieved.

WP1  
Specification & Defective samples

WP2  
NDT techniques, Sensors & Systems

WP3  
Development of the Robotic Manipulator

WP4  
Integration & Validation

WP5  
Demonstration

WP6  
Training

WP7  
Exploitation & Dissemination

WP8  
Project Management

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The X-Scan partners will provide a well-balanced group as they fit into a supply chain leading to the final prototype system. The Consortium believes that they provide the best people with the best facilities. To successfully deliver the X-Scan project, Together, the SMEs and RTDs introduce a diverse range of experience from across Europe and have no internal competitive elements. The End User who supports this project, will provide feedback on their requirements, and they will commit staff time to support the project and provide access to facilities during the early stages of the project and at the field trials.

The consortium consists of 7 partners from 4 member states, including 3 SMEs each representing a different EU country. The SMEs range from service providers to high technology equipment organisations. In addition there are strong participants from Research (3 participants) and an Industrial Sector participant, who has a strong and particular interest for this project.

<b>SME Partners</b>	
	Tecnitest (Tecnitest Ingenieros S.L, Spain)
	Vernon (VERMON S.A., France)
	Spectrumbiabs (Greece)
<b>OTH Partners</b>	
	Lloyds (Lloyd's Register Group, UK)
<b>RTD Partners</b>	
	TWI (TWI Ltd, UK)
	UBRUN (Brunel University, UK)
	Innora (Innora Robotics & Automation Limited, Greece)

The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA Research Executive Agency ([http://ec.europa.eu/info/research-and-innovation/funding/erpfundingschemes/european-research-programme\\_en](http://ec.europa.eu/info/research-and-innovation/funding/erpfundingschemes/european-research-programme_en)) ([FP7/2007-2011]) under grant agreement n° 285007.

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WP1. Specification & Defective Samples  
A specification document will be generated, detailing all the aspects of the project. This document will be used to guide the overall work packages. At the same time test samples will be designed, procured / manufactured for the development and the testing the three sub-systems.

WP2. NDT Techniques, Sensors & Systems  
The objective of this WP is to research and develop advanced NDT techniques to inspect the welds required by the end users. The RTDs will develop techniques for PAUT, ACFM and laser seam tracking to fulfil the SMEs requirements. These will be optimised for various weld configurations in thin plates.

WP3. Development of the Manipulator  
The prototype manipulator will be designed and manufactured to deliver the NDT sensors and systems to the appropriate point of the weld for the inspection. The laser tracking/guidance sub-system will be used to guide the manipulator.

WP4. Integration and Validation  
It is of particular importance to the SMEs and end-users that the NDT techniques developed in the program are acceptable to the classification societies. To do this the completed system will be tested on the sample pieces created in WP1, along with any other samples submitted by the end-users. The results of this will be compared to the end-users currently accepted techniques to assure effectiveness. The SMEs will oversee the validation work.

WP5. Demonstration  
It is of particular importance to the SMEs and the RTDs to first demonstrate the final system capabilities to the project end-user and latter to the industry.


WP6. Training  
The knowledge generated in the project will be significant, and must be absorbed by the SMEs. The aim of this WP is to ensure that the SMEs have a good understanding of the NDT techniques generated in the project (D6.1). It will also be to the benefit of the SME to ensure that the end-users have a good understanding of the new techniques generated by the project, so they might understand what can be achieved as a result of the project. The demonstration of the X-Scan (D6.2) unit to a selected audience will also helped with the exploitation of the project results by generating interest from the industry.

WP7. Exploitation & Dissemination  
The dissemination will be managed through WP7 and will focus on dissemination across other industry sectors and developing supply chains. Traditional routes such as publications, conferences, and workshops will be used, for the material generated in the project deemed suitable for wider dissemination. A pilot training course will also be developed and given to staff of Spectrumlabs and Tecintest for the purpose of implementing the equipment on site.

WP8. Project & Coordination Management  
The overall project will be monitored and controlled in a management task in WP9 to ensure deliverables and reports are produced in time and within budget.

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### Profile

Tecnitest is an NDT engineering company (with 15 to 20 full time employees and many sub-contractors) addressing its activity to different industrial sectors. It pays special attention to the use of advanced technologies and designing its products and services, either that related with production quality control or with predictive maintenance, with a well defined goal: optimisation of inspection cost, time and reliability.

[www.tecnitest.com](http://www.tecnitest.com)

Tecnitest main activities are:

- Sales and Technical Support of NDT equipment and accessories
- Development and Production of NDT Systems and Solutions
- Consultancy and Level III Services
- Training in NDT

### Participation

In this project, Tecnitest will get involved in the integration and validation stage of the project. They will act as SME director and will be in charge of Exploitation and Dissemination. They will also provide guidance for the development of the ACFM sub-system.


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[www.vermor.fr](http://www.vermor.fr)

**Profile**

Vermor was established in 1984 with the objective of advancing the state-of-the-art in ultrasonic phased array transducer design, and has become a world leader in 1-3 piezoelectric composite technology. OEM manufacturers worldwide are supplied with high quality, high performance transducers and probes for a variety of diagnostic imaging applications. Vermor's manufacturing facilities include: - 10000 sq. ft environmentally controlled production area, in-house tooling design and fabrication, computer controlled dicing saws for composite and array equipment, electroplating facilities, vacuum encapsulation equipment, moulding equipment, environmental chambers for temperature, humidity and special chemical compatibility tests, sophisticated transducer modelling software, CAD tools for mechanical and electrical design, computer based automated acoustic testing systems and Steris One R system for testing probe materials for Steris compatibility.

**Participation**

Vermor will manufacture the PAUT probes specified by the research carried out by TWI. After the completion of the project, Vermor intend to patent, manufacture, market and sell the PAUT methodology and sensors.

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[www.spectrum-labs.gr](http://www.spectrum-labs.gr)

**Profile**

Spectrumlabs is a provider of services to the marineshipping industry. It provides a full range of quality control and inspection services that includes mechanical testing, chemical analysis, materials failure analysis and Non Destructive Testing. Within the scope of NDT are included x/y rays radiography, electromagnetic and ultrasonic techniques, laser alignment and vibration analysis technologies.

The company is certified by BVQI to ISO 9001:2008 and is also accredited to ISO 17025:2005 by ESVD. A close collaboration exists with Classification Societies and industrial certification organisations including Lloyds Register, GL, DNV, ABS, BV, Class NK, SGS and TUV.

**Participation**

Spectrumlabs will be involved in the image processing of the output from the laser navigation sub-system, the build/design of the manipulator and the Field/Validation trials for the laser sub-system developments. They will also guide the development of the ACFM sub-systems with Technest.

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### Lloyds



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#### Profile

Lloyds works around the world to assess and certify ships, systems and facilities to improve quality and increase safety - a clear purpose shared by 5 000 employees globally. We work closely with ship owners, operators and builders to provide innovative, value-added solutions that help improve business performance throughout the design, construction and operation of ships. Standards have to be applied consistently, and they have the confidence and experience to do this. Lloyds are an independent organisation and throughout their history, they have responded to change and led the developments that have made lives safer and helped the maritime business prosper.

#### Participation

To input into WP1, Specification requirements and samples, WP4 and 5, Field Trials and demonstration, and WP7, dissemination & exploitation. Input and advice through all aspects of the project as to the legislative and ship certification throughout industrial world in terms of ship build inspection requirements and in-service inspection requirements

Lloyds are one of the top four ship certification organisations in the world. They will provide invaluable expert advice on the industry, ship inspection requirements and acceptance levels.

#### Member area

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#### Profile

Established in 1966, Brunel is a higher education institution with more than 15,000 students situated in West London, England. The annual turnover is 220€ million including a research income of more than 16.5€ million. In the latest UK Government Research Assessment Exercise, 82% of research submitted was rated as of international standing. UBRUN comprises of 8 academic Schools and 7 Specialist Research Institutes, conducting research ranging from social sciences to engineering to health and social care. Brunel University is now recognised as a major force in the UK higher education scene. The University maintains close links with industry in teaching, research and technology transfer. UBRUN is currently coordinating several FP7 EU projects: HIPERDINO (ICT-Energy), 3D VIVANT and UbIPOL (ICT), ERINA4Africa (Infrastructures), CEES (IAPP project), PHARMAS (Environment) and several projects in "Research for benefits of SMEs" strand. It is also a partner on several projects in "People" and "Cooperation" (ICT, NMP, SSH) FP7 programmes, and on CIP-IEE-2009, eContentplus - ICT-PSP, Clean Sky and Intelligent Energy Europe programmes. Within last two years, UBRUN has secured more than 69 M in European funding.

**Brunel Innovation Centre (BIC)** is located in Cambridge. BIC's research and development activities cover acoustic, guided waves and associated NDT technologies such as sensors and systems for structural health monitoring and condition monitoring. BIC research and innovation cover the whole range of activity from fundamental scientific studies through to the transfer of technology to industry, and it has an outstanding international reputation throughout this spectrum of activities. BIC is in communications with industry and academia both in the UK and notably across Europe in an effort to conduct research and development projects for advanced process/product development and achieving science in excellence.

#### Participation

Research provider for WP2 - Development of laser tracking/guidance sub-system. Also input into:

- WP1. Specification & Defective Samples
- WP3 Development of the Manipulator
- WP6. Training
- WP7. Exploitation and Dissemination

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