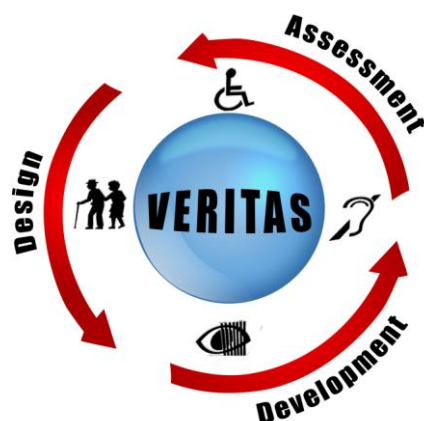


Accessible and Assistive ICT



VERITAS

Virtual and Augmented Environments and Realistic User Interactions To
achieve Embedded Accessibility Design S

247765

Project Presentation and Project Description Leaflet

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Abbreviations list

Abbreviation	Explanation
3D	Three Dimensional
EU	European Union
ICT	Information and Communication Technologies
OSP	Open Simulation Platform
VR	Virtual Reality
UC	Use Cases
UIML	User Interface Markup Language
USIXML	USer Interface eXtensible Markup Language

Executive Summary

This deliverable entitled D4.1.3 “Project Presentation and Project Description Leaflet”, aims at giving a brief overview on the VERITAS Project “Virtual and Augmented Environments and Realistic User Interactions To achieve Embedded Accessibility DesignS” - Grant Agreement no 247765. The reader is provided with relevant information regarding the project objectives, expected results, vision and approaches. In particular it will be underlined how the project activities will bring the consortium to reach the main project objectives.

This presentation as well as a short project description (Appendix 2) will be used as initial dissemination material, until new publications that will reflect project developments will be developed during the project. Moreover, the short Project Presentation, being set out in this Deliverable, has been structured according to EC Guidelines and covers the following main headings: contract number, project acronym, project name, priority /priority component (e.g. Strategic Objective, etc.), project logo, list of participants (organisation name, country), total cost (k€), commission funding (k€), project main goal(s), key issues, technical approach, expected achievements/impact, coordinator contact details.

1 Introduction

It is important to realise that people with disabilities are not just a tiny minority of the population of the European Union. The lowest appraisal, based on the currently defined disablement categories, estimates their total number at around 74 Million persons. However, other estimates that take into account a) people with cognitive impairments, and b) those people in the so-called hinterland between fully able bodied and the classically termed people with disabilities, should considerably raise those numbers, as highlighted below:

- In the EU 27 countries about 16% of the population are over 65, a number that is estimated to rise rapidly in the coming years¹.
- Up to 15% of the population across the European Union has a disability, such as a visual, hearing, speech, cognitive, or motor impairment².
- Around 20% of people over 50 experience severe physical disabilities
- Spending on pensions, health and long-term care will rise sharply over the next 20 years

Despite the rapid evolution of ICT over the last years and the increasing acknowledgment of the importance of accessibility, the developers of mainstream ICT-based products still act and struggle under total absence of structured guidance and support for adjusting their envisaged products and services with their users' real-time accessibility needs. As a result a critical mass market, including that of older people and people with disabilities remains highly locked because of a lack of friendly ICT-based products and services targeting older people and people with disabilities,.

A similar situation is observed in the development of non-ICT products and services, where developers toil to test and evolve their prototypes in terms of functionality, without however being able to systematically assess their developments in terms of their accessibility.

Thus, it is a technological challenge to provide senior citizens with systems that could foster the different facets in the perception of quality of life. These systems should improve the level of independence, promote the social relationships, leverage the immersion in the environments and encourage the psychological and physical state of the person.

The European Disability Action Plan priorities for 2008-2009 include a focus on accessibility and emphasise that 'Accessible goods, services and infrastructures are essential to sustain non-discriminatory and inclusive forms of participation in many aspects of everyday life', and that 'Achieving accessibility requires the avoidance and removal of barriers that prevent people with disabilities from exercising their capabilities and participating fully and on equal terms'. An estimation regarding the user demand for accessible ICT products, services and assistive technologies among the EU (50+ population) has been examined by the European study "The Demographic Change – Impacts of New Technologies and Information Society" (following figure 1). As depicted in this figure, designing and developing for people with disabilities is becoming an increasingly important topic for a variety of reasons.

¹ Eurostat yearbook 2008.

² Report of the Inclusive Communications (INCOM) subgroup of the Communications Committee (COCOM) COCOM04-08.

Indicator of potential market size		Demand potential in Mio		
Indicator for need	Degree of impairment	2010	2020	2050
Vision problems	slight/ moderate	46.3	53.1	59.1
	severe	20.5	23.5	26.2
Hearing problems	slight/ moderate	44.4	51.0	56.7
	severe	8.5	9.8	10.9
Dexterity problems	slight/ moderate	32.5	37.2	41.4
	severe	17.1	19.6	21.8
More than one of these	slight/ moderate	73.5	84.3	93.7
	severe	35.9	41.2	45.8

Source: Own calculation demographic data available from SENIORWATCH 2002 and demographic projections from Eurostat 2005

Figure 1: User demand for accessible ICT products, services and assistive technologies among the EU 50+ population [From Study "The Demographic Change – Impacts of New Technologies and Information Society" http://ec.europa.eu/employment_social/social_situation/studies_en.htm].

Consequently, even if people with disabilities want to be independent and do things for themselves by themselves, unfortunately, most applications, services, goods or infrastructures are not fully accessible today. Shortcomings concerning the accessibility of today's ICT and non-ICT products are summarized in the following:

- Although a wide range of principles, guidelines and standards for accessibility and universal design for various types of applications, services, goods and infrastructures are available from standardization organizations (e.g. Mandate 376: Accessibility requirements for public procurement of products and services in the ICT domain or the Mandate 420: Accessibility of the Built Environment), adopting and verifying them during design and development is not always sufficient even in the user-centred design process, since they do not provide explicit guidelines to the developers.
- The building, automotive and other industries have responded to the accessibility needs by producing special products and spaces for special groups, however, "special" is often synonymous with "expensive". Specialization leads to complicated building standards and products which, in the end, seldom meet the needs of more than a fraction of those they were meant to help and often seem to stigmatize and separate them further from other people.
- ICT application development rose significantly over the last decades. However, the importance of accessibility has only begun to be appreciated in the last few years. Any solution that is older than that is unlikely to be fully accessible. Making an existing system accessible is often very difficult and expensive, in much the same way as making an existing building wheelchair-friendly.
- Many developers and designers are not fully equipped with evidence and knowledge related to the accessibility to their products or services. Consequently, even the latest developments are not adequately accessible, missing the opportunity of tackling this issue at the development stage, when costs are compatible and solutions by design can be found, rather than adopting aftermarket or adaptations.
- Existing development tools and packaged solutions (e.g., several CAD tools or simulation environments) give little out-of-the-box assistance in most cases or, at worst, make it impossible to design and develop accessible non-ICT solutions. It is important that the development of accessible ICT and non-ICT products are supported in an automated way as much as possible. We need tools that automatically assess the accessibility of a product

with regard to specific user groups, and provide process-integrated and constructive guidance to the developer in how to apply the accessibility principles.

- An inherently accessible and technically elegant application cannot be considered a success if it does not satisfy the end user needs. However, real end users are still frequently left out of the overall development process. Thus, capturing user demands and expectations can not be considered as a simple task and requires the effort of many different groups (developers, designers, testers, etc.) in the product development lifecycle. For that reason a User Centered Design approach should be considered as an enabler for the design of accessible products.
- Some market stakeholders believe that creating accessible solutions will have prohibited costs and, at the same time, make them boring and less attractive to the majority of users. A common issue of many development processes is the friction between the different groups of stakeholders involved in each ICT or non-ICT project because they have different motivations and expectations on what will be delivered. As an example, developers think in terms of code, businessmen think in terms of added value (cost-benefit relationships) and interface designers think in terms of customer experience and satisfaction. Reconciling these different languages and placing the end users at the centre of the design and development phase is a challenge.
- Accessibility regulations and policies will in many cases require that a product has to be accessible to users with a very broad range of functional limitations, including individuals who are older and often have multiple functional limitations.
- In most cases, assessment accessibility activities exist only for some ICT solutions and are performed after the development process instead of accompanying the entire lifecycle as a continuous approach to quality. Early testing can significantly lower the cost of completing and maintaining the developed products.

Thus, the lack of non-accessible products can cause large productivity losses, with many people being unable to fully participate in working life, in education, or in a wide range of economic and social activities. People's choice of leisure activities may be narrower than it otherwise could be. The cost of making products and services more inclusive do not need necessarily to be very high. The lack of progress on accessibility reflects the current fragmented approaches to producing accessible products and services, which rather limits their economic potential and creates a barrier to a thriving integrated market for them in Europe.

The core concept of VERITAS is to research and develop an open framework for providing built-in accessibility support at all the stages of realisation of mainstream ICT and non-ICT technologies. The project aims at delivering to product/software developers 'generic' instructions - embedded in an empowering virtual reality platform for exploring new concepts, designing new interfaces and testing interactive prototypes that will inherit universal accessibility features, including compatibility with established assistive technologies. By achieving these goals VERITAS is expected to operationalise and potentially revolutionise accessibility testing at all stages of design and development of new products in five very important industrial domains. The main VERITAS innovation lies in the fact that, even if there have been some limited and isolated attempts to support accessibility testing of novel products and applications, there is a clear lack of a holistic framework that supports comprehensively virtual user modelling, simulation and testing at all development stages and realistic/immersive experience of the simulation.

As well as serving well many of the general objectives of the ICT Work Programme 2009, the project mainly targets the expectations of Challenge 7: ICT for Independent Living, Inclusion and Governance with a specific focus on the Objective ICT-2009.7.2: Accessible and Assistive ICT, target outcome a) Embedded Accessibility of Future ICT, of the 7th Framework Programme.

2 Consortium

The Consortium includes 32 beneficiaries, representing in good balance all key actors in the field of Accessible ICT, namely industries (s/w houses and manufacturers), industrial SMEs, research centres, universities, and end-users organisations. All of them, as a whole are in an ideal position to embed accessibility “everywhere”, since they provide highly complementary input with respect to:

- **End users’ representation** (*MCA, AGE*); they will make sure that the end-user stays central during the whole project.
- **Scientific and technological development work** in all the fields required by research partners (*CERTH, Fraunhofer, PERCRO, UNEW, ITACA, UPM-LST, UNITM*) and innovative SMEs (*HS, ReLab, Hypertech, I+, SMARTEX, Byte, Domologic*).
- **Infrastructure (pilots sites)** enabling the validation and demonstration of the VERITAS solutions (*CRF, Piaggio, Baunion, UNEW, CERTH, FIMI*).
- **Wide dissemination and exploitation** of the project outcomes and promotion to third parties such as other industrial fora, policy makers and public administrations (notably in the social security and education / work life domains) at national and trans-national level (*AGE, MCA, all industrial partners, large academic partners*).

Many industrial partners function both as industrial users and strong software developers in the consortium. Some of them have large research and development activities in accessibility of mainstream ICT. Thus the VERITAS consortium is in an excellent position to work towards the realisation of all of the above objectives related to accessible mainstream ICT, because leading industrial players from the following domains are present:







- **FIMI**: is belonging to the Healthcare Division of Philips, a worldwide leading manufacturer of medical equipment;
- **CRF**: offers a wide range of technical competencies and is equipped with state-of-the-art laboratories for the testing of powertrains, electro-magnetic compatibility, experimental noise and vibration analysis, driving simulation and virtual reality;
- **LMS**: an engineering innovation partner for companies in the automotive, aerospace and other advanced manufacturing industries;
- **Atos Research & Innovation**: covers areas and technologies related to technology enhanced learning, e-inclusion (accessibility, assistive technologies, adaptability, etc.), methodologies for user involvement in the innovation process;
- **Piaggio**: one of the world leading manufacturers of powered two-wheelers and the leader in this sector on the European market;
- **CAF**: one of leading manufacturers of sensors to be deployed in cars for the measurement of several car and driver-related data;
- **INDESIT**: is a leading manufacturer of home appliances and automation devices;
- **VRMMP**: is a leading provider of hi-tech products including multimedia and virtual reality applications and technologies;
- **BYTE**: is an ICT applications and custom solution for business provider.

All this industrial knowledge is combined with strong expertise of **research institutes, universities and industrial SMEs** in research and development of:

- **User centered design and evaluation**: *UNEW, CERTH, Fraunhofer, UoS*;
- **Open high-level simulation frameworks** for built-in accessibility in mainstream ICT and non-ICT applications: *Fraunhofer, FIMI, CERTH, VRMMP, ITACA*;
- **Immersive simulation frameworks**:: *Fraunhofer, CERTH, VRMMP*;

- **Innovative multisensorial platform development** for virtual user model testing and training: *SMARTEX, CAF, CERTH, UNEW*;
- Innovative, user-friendly **user interfaces design**: *Fraunhofer, ReLab*;
- **Innovative applications in various sectors**: *HS, Fraunhofer, CRF, Piaggio, Baunion, AIJU, FIMI, I+, CERTH, Hypertech*.

The VERITAS Consortium members appear in the following table 1. The Project Coordinator contact details are listed in Appendix 1 of this document.

THE VERITAS CONSORTIUM	
	Fraunhofer Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. - Germany
	CERTH/ITI Centre for Research and Technology Hellas Informatics and Telematics Institute-Greece
	CERTH/HIT Centre for Research and Technology Hellas Hellenic Institute of Transport- Greece
	FIMI Fimi srl - Italy
	ITACA Instituto de Aplicaciones de las Tecnologías de la Información y de las Comunicaciones Avanzadas - Spain
	CRF Centro Ricerche Fiat Società Consortile per Azioni - Italy

THE VERITAS CONSORTIUM



FORTH- ICS
Foundation for Research and Technology Hellas, Institute of
Computer Science – Greece



CAFS
Continental Automotive France SAS - France



UNEW
University of Newcastle - UK



PERCRO
Scuola Superiore Di Studi Universitari e di Perfezionamento
Sant'Anna - Italy



AGE
La Plateforme Europeenne Des Personnes Agees et
Retraitees - Belgium



BYTE
BYTE COMPUTER S.A. - Greece



RELAB
RE:Lab - Italy



UNITN
Università degli studi di Trento - Italy

THE VERITAS CONSORTIUM	
	VRMMP Virtual Reality & Multi Media Park S.p.A. - Italy
	MCA Marie Curie Association - Bulgaria
	CVUT Ceske Vysoke Ucenı Technıcke v Praze - Czech Republic
	COAT Universität Basel - Switzerland
	INDESIT Indesit Company S.p.A - Italy
	DOMOLOGIC DOMOLOGIC Home Automation GmbH - Germany
	LMS LMS International NV - Belgium

THE VERITAS CONSORTIUM



ATOS
ATOS Origin Sociedad Anónima Española - Spain



AIJU
**Asociación de Investigación de la Industria de juguete,
 conexas y afines - Spain**



PIAGGIO
Piaggio & C. S.p.A - Italy



SMARTEX
Smartex s.r.l. - Italy



HS
Human Solutions GmbH - Germany



BAUUNION
Bauunion 1905 GmbH - Germany



HYPERTECH
Hypertech S.A. - Greece



I+
I+ srl - Italy





THE VERITAS CONSORTIUM	
	US University of Salzburg - Austria
	BU Brunel University - UK
	UPM Universidad Politécnica de Madrid / Life Supporting Technologies - Spain
	USTUTT Universität Stuttgart - Germany

Table 1: VERITAS Consortium members

3 Project Data

The following table summarises the project data:

Contract Number	247765
Project acronym	VERITAS
Project Name	Virtual and Augmented Environments and Realistic User Interactions To achieve Embedded Accessibility DesignS
Programme	Accessible and Inclusive ICT (objective FP7-ICT-2009-4)
Date of start	01 st January 2010
Duration	48 months
Total Cost	11,678,787.00 €
EC Contribution	8,000,000.00 €
Project Web Site	http://veritas-project.eu/

Table 2: Summary of project data

4 Project Objectives

The main research/scientific and technological objectives of the VERITAS project are listed in the following paragraphs, clustered into research/scientific and technological objectives.

Research / Scientific objectives

SC 1: To investigate and develop an open library of various categories of virtual user models, including VR models, covering a wide range of population groups and especially focusing on groups in risk of exclusion, e.g. older people, people with disabilities (vision, hearing, speech, motor), people with co-existent conditions, etc.

SC 2: To develop an Open Simulation Platform (OSP) for virtual reality simulation and testing of new products at all stages of iterative product planning and development, i.e. specification, design, development, validation and testing.

SC 3: To develop an extensive list of virtual reality tools for supporting accessibility testing at all stages of development of existing applications of partners of the VERITAS consortium, covering the domains: a) automotive, b) smart living spaces, c) workplace design, d) infotainment and e) personal healthcare and wellbeing.

SC 4: To research and develop methodologies for introducing the VERITAS simulation and testing framework, including the virtual user and the simulation models, to a wide variety of ICT and non-ICT applications.

SC 5: To research and develop a framework for immersive virtual user simulation and testing, i.e. putting the developer in the position of the user through virtual/augmented reality simulation.

SC 6: To define measures and metrics for evaluating software accessibility for every application scenario during design and development through VR simulation (graphs, statistics, distance metrics in general).

SC 7: To research and develop innovative concepts for ambient, multi-device, universally accessible and usable multimodal interfaces through VR simulation.

Technological objectives

TE 1: To create virtual user models for all supported categories of older people and people with disabilities. Virtual user models will be created taking into account the physical, cognitive and behavioural/psychological modelling of the users with disability based on a) the analysis of real user needs and wants, b) the incorporation of guidelines, standards and methodologies and c) training with real users and getting feedback through a multisensorial platform.

TE 2: To adopt a user-centric approach in virtual user modelling, in which user physical, cognitive, behavioural and psychological tasks related to the five main application areas of VERITAS are analysed and modelled for all user categories of older people and people with disabilities supported in VERITAS.

TE 3: To introduce new techniques for older people and people with disabilities virtual user model generation based on ontologies for abstract user model representation and UIML/USIXML for the association of the virtual users with tasks mainly related to the interaction with the application interfaces.

TE 4: To provide parameterized modelling of the users so as to allow the automated and parameterized generation of a large pool of virtual users that will comprise the test-bed subjects for the simulated accessibility evaluation of the ICT or non-ICT products.

TE 5: To provide an advanced virtual user modelling procedure so as to allow the parameterized modelling of the users with disability that will enable the VERITAS platform to perform:

- Parameterized generation of the desired number and type of virtual users based on a special user model generator tool providing parameterized user models.
- Rapid automated assessment of the interaction quality of a prototype, using the desired number and categories of virtual users.

TE 6: To provide a multisensorial platform for virtual model training. The platform will utilize interaction of real users in the virtual environments, in terms of their physical cognitive, behavioral and physiological response, to tune the virtual models and provide sufficient feedback for the quantitative evaluation and verification of the user models.

TE 7: To provide a VR Open Simulation Platform (OSP) that will serve as an enhanced open evaluation engine offering multiple and various simulation models to ICT and non-ICT product developers. An extensive set of simulation models will be generated by analyzing the requirements of all the application areas targeted within VERITAS.

TE 8: To provide the core and the immersive simulation platforms - the basis of the OSP - which will “sense” the input data from the virtual user as well as from the virtual environment and process all information in real-time, actuating accordingly the virtual environment. The simulation platform will provide the means of simulating the use of the virtual prototype using the desired number and category of the targeted virtual users. They will incorporate:

1. The virtual environment simulation that will provide realistic physical simulation of the underlying virtual environment. It will serve as a test bed for the accessibility evaluation and the simulation of the virtual prototype of the product being subject to evaluation;
2. The immersive simulation environment that being comprised of advanced VR devices for realistic 3D visualization and interaction - for putting the designer in the position of the user with disabilities;
3. The virtual interaction manager for modelling and managing all interactions taking place in the virtual environment between the product and the virtual user.

TE 9: To provide the VERITAS exportable toolbox adaptors, including the interaction adaptor and the virtual user and simulation models adaptor (supporting also authoring and parameterisation). The toolbox adaptors will serve as a middleware between the developer and external to VERITAS simulation platforms. It will further provide seamless integration of the virtual prototype into the simulation platform without the need of low-level programming. So the developer may focus on more critical issues of the accessibility of the prototype. The interaction and the user and simulation model adaptors will provide customized and parameterized tools enabling the developers to test in their own external applications, and to experiment on new or alternative interaction concepts using a large variety of virtual users.

TE 10: To design and implement the VERITAS interaction manager, which handles the interactions between virtual and real users with the environment, potentially using existing assistive devices appropriately modelled within the VERITAS OSP.

TE 11: To develop a multimodal interaction manager to be used in future developments for enabling appropriate translation of dynamic content into different modality forms, according to the concept of modality replacement and for providing a multimodal interface that will be adapted on the fly and based on the context according to the user real-time accessibility needs.

TE 12: To research and develop a framework for virtual testing and fine tuning of ambient, multi-device, universally accessible and usable multimodal interfaces in realistic scenarios through VR simulation.

TE 13: Explore and apply the concept and developments of the VERITAS platform in practice and therefore provide validation in real industrial development contexts.

- a. Mainstream ICT: infotainment, ICT at everyday life applications;
- b. Emerging ICT: personal healthcare, ICT in automotive field (IVIS), ambient and VR environments (domotics, etc);
- c. Non-ICT systems: car, smart living spaces, physical environments (e.g. home, office). Special focus will be provided on the VR simulation of assistive devices.

TE 14: To provide a library of multiple virtual scene settings that will be customizable by the developer. They will include designs, code templates and examples of innovative, ambient, multi-device, universally accessible interaction concepts (i.e., sets of interaction process equivalents for all modalities, including combinations of modalities for efficiency).

TE 15: To define and implement the benchmarking platforms for software testing in VR environments (e.g. home, car, workplace, etc.) that will provide the test bed for the accessibility evaluation of other ICT or non-ICT products.

TE 16: To define measures and metrics for evaluating software accessibility during the development of every application scenario through VR simulation (graphs, energy, distance, metrics in general).

TE 17: To develop an assessment protocol and reporting tools for all application scenarios for the automated assessment of the behaviour of the virtual users in the simulation platform according to the virtual user models and to specific accessibility and ergonomic restrictions applied by the developer of each distinct product.

5 Technical Approach

5.1 Overall Architecture and Modules

The overall layered architecture of the proposed system is shown in following Figure 2:

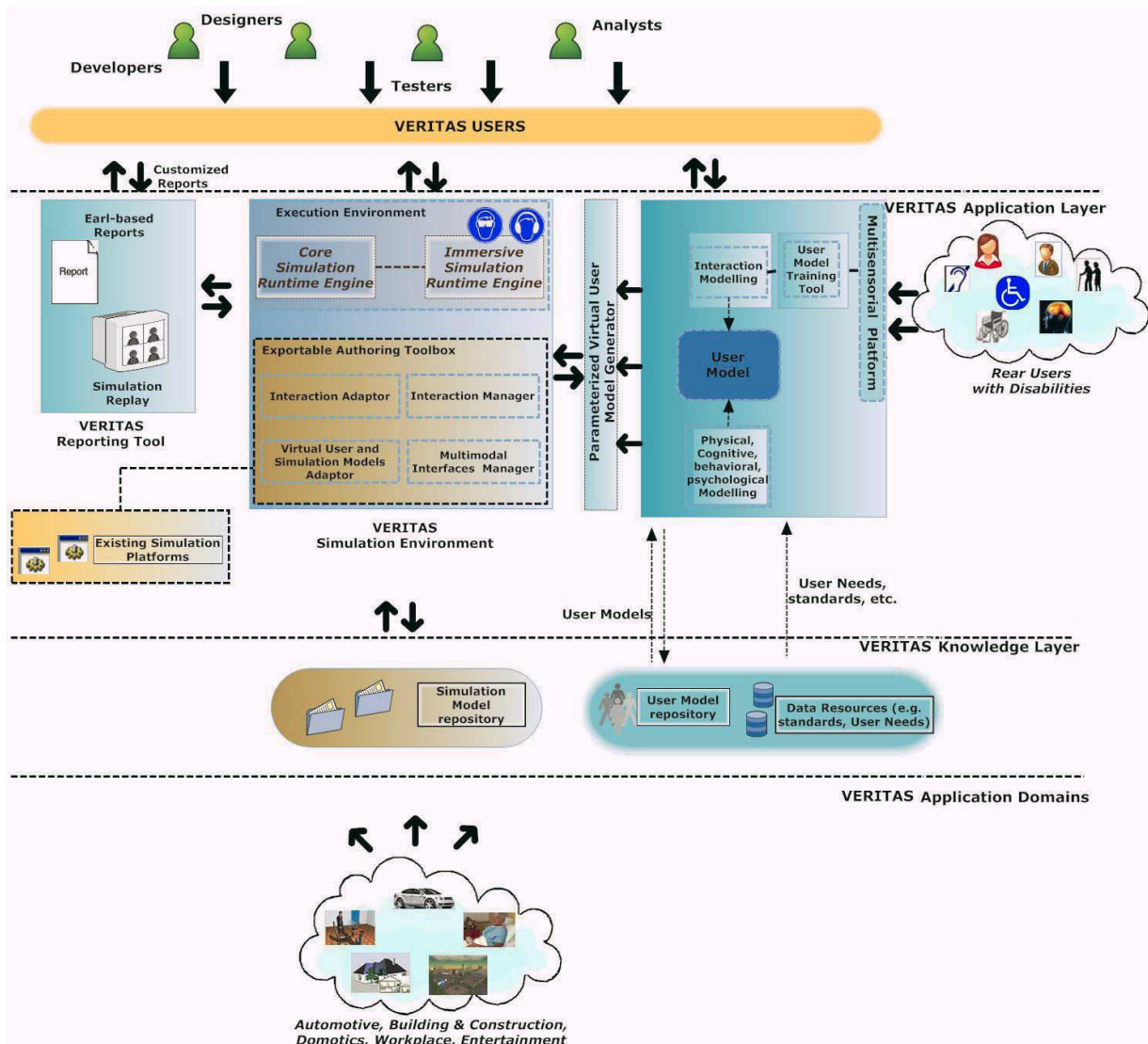


Figure 2: The VERITAS architecture

The main components of VERITAS, as depicted in Figure 2, are:

(a) The Core and Immersive Simulation Environment (being developed in sub-project 2):

The **Core Simulation Platform** will be the fundamental module of the VERITAS environment. It will provide to the user simulation capabilities in two different contexts; either using immersive VR and providing to the user (developer) a simulation scenario where he/she would interact with the virtual environment as if being a user with disabilities with a specific profile, thus directly testing the accessibility of a product or by using the simulation engine with virtual users who will explicitly test the accessibility of the products according to the respective simulation models and scenarios. The VERITAS simulation platform should comply with the following properties of VR simulation platforms:

- Performance: Supporting shaders, Level of Detail (LOD) processing, occlusion culling, etc.
- Extensibility: Easily import simulation and modelling tools
- Compliancy: Should be compliant with major simulation, modelling formats and standards (X3D, HANIM, etc.).
- Scalability: Run optimized in multi-core multi-gpu systems both in OpenGL and Direct3D.
- Multi-language support: Be compliant with many programming languages and interfaces.
- Recovery: Efficient error handling
- Documentation-support: Extensive documentation and support are of critical importance.

The **Immersive Simulation Platform** of VERITAS will be used for virtual user simulation and will offer the designer/developer the possibility to experience the simulation from the position of the user. Immersive simulation will offer realistic and iterative testing facilities to the designer as well as multimodal (visual, aural, etc.) feedback in order to support virtual user testing (putting the designer in the position of the user). Using the immersive platform the designer will be able to experience in a realistic way the interaction of a user with disability with the designed environment and assess accessibility both as an observer and as a participant to the simulation.

(b) The VERITAS Exportable Toolbox (being developed in SP2):

The VERITAS exportable toolbox consists of all the tools that will be implemented to support the incorporation of the VERITAS virtual user models into external – application specific – simulation environments. The following tools will be included in this module:

- *Interaction Manager*: will manage the interaction with the VR environment supporting both traditional VR interaction tools (such as wands, joysticks, pointing devices, etc.) as well as new interaction tools utilising various VR devices (haptic, tactile, etc.);
- *Interaction Adaptor*: will provide tools to the external of VERITAS simulation applications in order to adapt the VE and the interactions edited with the external simulation environment to the VE used in VERITAS. The purpose is to achieve the same functionalities with the VERITAS core in terms of VE and interaction support;
- *User and Simulation Models Adaptor*: a generic tool that will be offered by the core platform of VERITAS to support interconnection of the VERITAS Exportable Toolbox to other existing simulation environments;
- *Multimodal Interfaces Manager*: a tool for supporting multimodal interfaces in the VERITAS simulation platform as well as existing simulation platforms.

(c) The Multisensorial Platform and the Virtual User Model Generator (being developed in SP 1):

The **Multisensorial Platform** will be used for the training of parameterized user models based on real user measurements in real testing conditions. The multisensorial platform will be fully parameterised and adapted to the VERITAS application areas and will be used to capture user feedback while executing a number of tasks which will be mapped in the VERITAS virtual user models. Special sensors will be used for data capturing ranging from face monitoring cameras for driver monitoring to wearable sensors for body motion analysis, and to motion trackers and gait analysis sensors for analysing user kinematic patterns while executing specific activities and tasks and also to environmental sensors for monitoring the interaction of users with the real environment.

The **Virtual User Model Generator** of VERITAS will be the interface between the virtual user model repository and the VERITAS simulation platform. The VERITAS user model generator will take into account all predefined physical, cognitive, behavioural/psychological parameters of the user models and will generate instances of virtual users that will then be subsequently used within the simulated accessibility evaluation of a virtual prototype. After the specification of several user parameters of the operator the virtual user generator will instantiate the virtual users whose properties are parameterized and can be on-the-fly modified by the operator. This way the operator is in full control of the simulation and the properties of the virtual user model.

(d) The VERITAS Knowledge Layer (populated, analysed and extended in SP 1)

The **Knowledge Layer** of VERITAS project will serve as the basis for the VERITAS models repository (simulation and virtual user models) as virtual user modelling is considered as one of the core research issue in VERITAS. The virtual user models will be generated based on existing standards and guidelines but also based on a multisensorial platform designed and implemented within VERITAS that will “sense” the needs of real users with disability by measuring their behaviour in simulated environments.

(e) The VERITAS Reporting Tool (being developed in SP 3)

The VERITAS reporting tools will be developed individually for each application scenario and will support the presentation of accessibility simulation results in a form helpful to potential receivers of test results, including designers and developers. Earl-based reports as well as simulation replay scenes will be provided to users in order to analyse the accessibility of their developments and for further improvements.

5.2 Pilot Applications

VERITAS aims at introducing embedded accessibility: developing groundwork, creating infrastructure and establishing standards in the following important domains:

Automotive and motorcycle

The VERITAS concept will constitute a key enabler to extend the vehicle’s range of usage and to feature mobility and inclusion of the older people and people with disabilities. This will be related both to packaging and physical usability of basic and extended vehicle functions, as well as to (cognitive) interaction issues and it will be achieved by design rather than by after-market adaptation, which produces sub-optimal solutions and higher costs. Rather, accessibility will be embedded in the product itself with a potential of giving benefits to the general population.

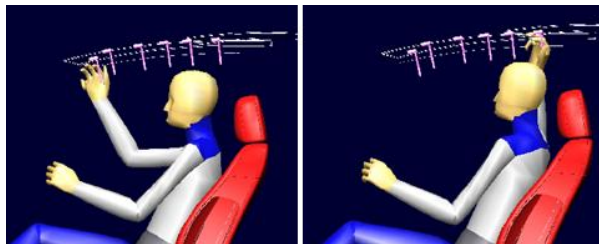


Figure 3: Automotive test bed within VERITAS

Also VERITAS will improve the motorcycle design capabilities in virtual environments that will enable the simulated accessibility and riding testing of prototypes (Figure 4) with virtual users. VERITAS will provide an efficient accessibility test bed and is expected to allow for very useful feedback to the designers. This concerns users with slight disabilities, who do not exhibit severe impairments and would therefore drive a motorcycle, but would however need assistance in riding due to their disability.

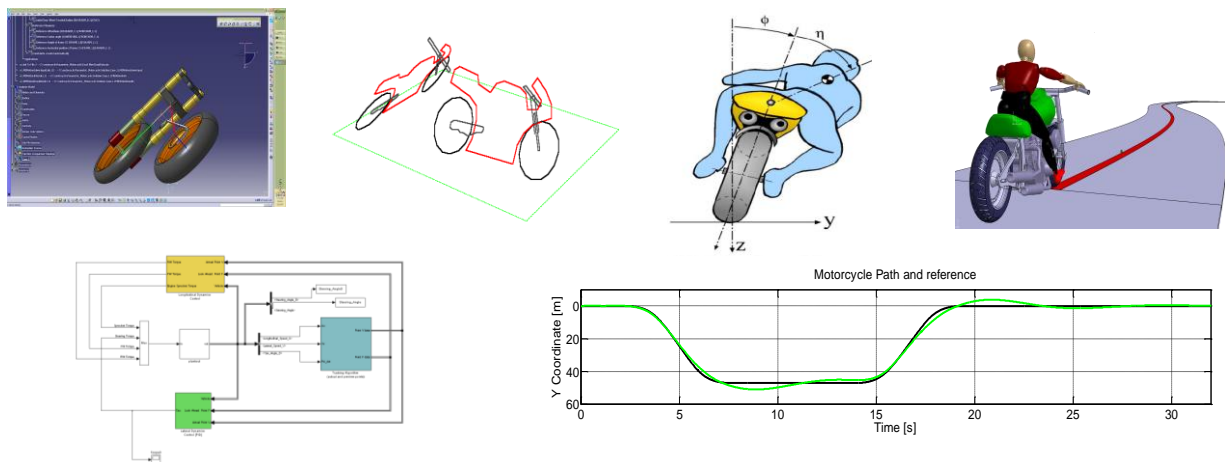


Figure 4: Motorcycle test bed within VERITAS

Smart Living Spaces

VERITAS will provide a virtual simulation environment for smart living spaces. A number of simulation models for domotic devices will be implemented (e.g. from INDESIT), describing their 3D view, the runtime behaviour and optionally a device-specific user interface. The VERITAS environment for smart living spaces will provide a model editor, to be used by interior designers for designing and editing a domotic environment. After design phase, the functionality of the system can be simulated. This will allow to evaluate the benefit of the system and to optimize the design by adjusting it specifically to the special needs of the user. VERITAS will complement the VRfx

platform of Fraunhofer with a set of functions and procedures, which will introduce the “disability factor” during the design phase. Ideally, libraries will be created, which the users of these programs will use to check and validate their designs in a variety of scenarios, representing people with different degrees of disabilities.

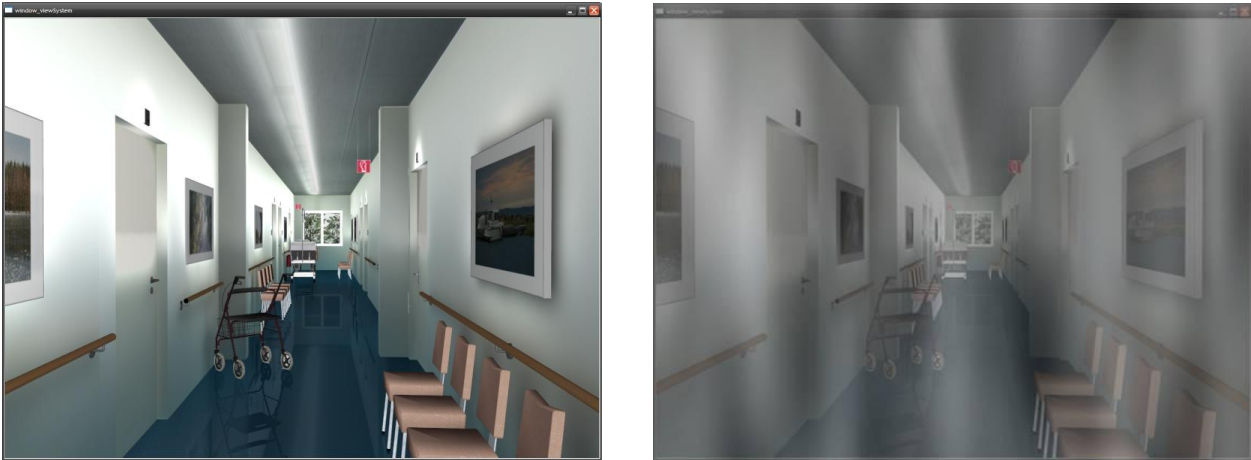


Figure 5: Simulation of visual impairments in immersive systems – unimpaired and cataract-impaired view.

Workplace

The expected outcome of this test bed is the design of an accessible workplace that will be finally evaluated with real users in a real application scenario. The integrated VERITAS simulation platform will be utilized so as to perform accessible workspace design both in the context of office scenarios and more complex workplace environments. Extensive testing and iterative optimization of the designs and the developments will be performed with virtual users.

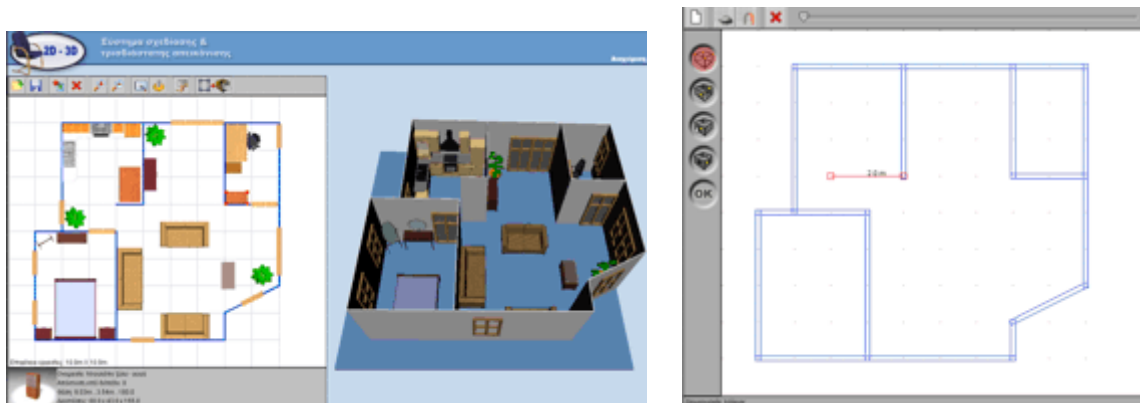


Figure 6: Workplace test bed within VERITAS

Infotainment

The VERITAS simulation platform combined with the gaming simulation models will be integrated in a commercial metaverse application (such as SecondLife), thus enabling the simulated interaction with the virtual user in the context of a real game scenario. Ideally the simulation will take place with the presence of many real external participants. The test bed will include apart from interactions with the scene objects and environment, communication with other players, socializing and all aspects of human behaviour included in the metaverse. Moreover, VERITAS will provide to the developer multimodal interfacing tools so as to enable the conversion of the game content into information that is easily perceivable by users with disabilities.



Figure 7: Second life Test bed

VERITAS will further apply its novel technologies in the game sector and especially in the design of games for the older people. Through the vast experience of core partners in the virtual reality technology along with the experience of partner AIJU in the development of ICT games for older people (ICToys), snapshots of which are illustrated in figure 8. VERITAS will focus in the accessibility evaluation with virtual older users, including minor disabilities that their age might imply. Several games for the older people for this purpose will be provided by AIJU. Factors to be studied and evaluated during the accessibility test include cognitive, motor abilities as well as the therapeutic value of the games so as to improve their quality of life.

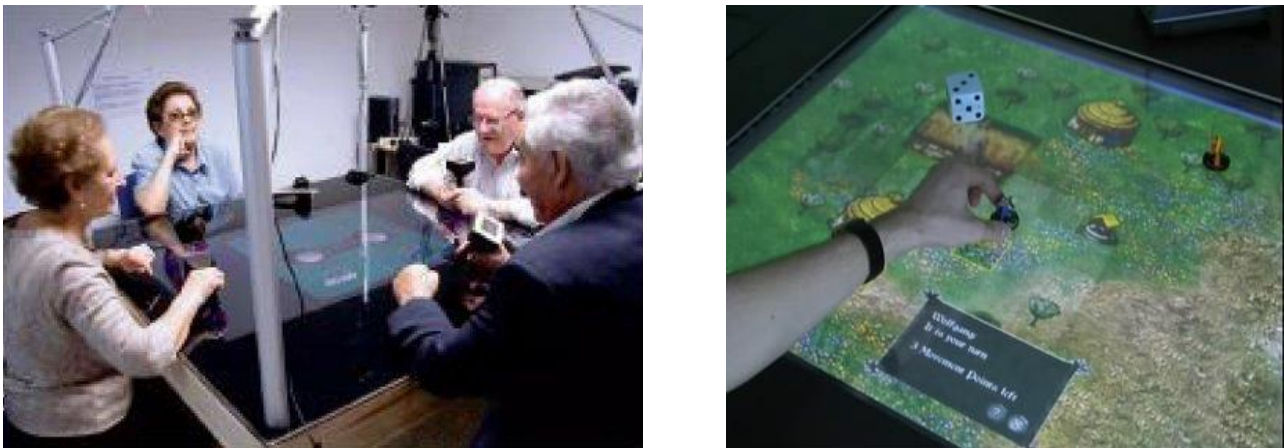


Figure 8: ICToys: Games for the older people developed by the AIJU partner

Personal HealthCare and Well-Being

The solutions currently available in the Personal Healthcare market lack in terms of usability and often experiences difficulties to be accepted by the users. It applies in particular to the older adults and to people which special needs representing the largest segment of potential users. There is the need of designing the personal healthcare products / solutions / services to guarantee accessibility and usability and to meet the acceptance of this special category of users.

VERITAS will propose a virtual simulation platform allowing automated and fast testing at all development stages. The usability and acceptance of the solutions will be related to the physical devices (hardware) used to deploy the service and to its interaction with the user, to the application (software) and its functionalities, to the contents provided to the user. A set of tools and methods will be designed including a set of simulation models of the solution under test, a set of simulated applications / usage scenarios, a set of indicators of the accessibility and the acceptance of the virtual prototype under test.

6 Expected impact

6.1 Strategic Impact / Societal Impact of VERITAS

Specifically, most of the ICT products are partially accessible or only accessible through external assistive devices. Most of the new technologies are designed by people without disabilities, not fully aware of the real problems, needs and abilities of the impaired. Consequently, the lack of accessibility built-in support at all stages of implementation of mainstream ICT and non-ICT applications provokes **social exclusion** and **isolation** for people with disabilities.

The **main objective** of VERITAS is to **increase the accessibility** of ICT and non-ICT products and services in Europe. It will focus on removing barriers caused by inappropriate design and development of products and services, which hinder particularly people with disabilities and older people.

Attempting to address every systemic form of discrimination, **VERITAS** provides the designers/developers with the opportunity to achieve realistic and iterative user testing at all development stages and thus, to offer mainstream ICT products/services, compatible with assistive devices and adjusted to visual, hearing, cognitive and mobility impairments. By covering almost every handicap, it proposes the **verification of the product through VR simulation of the end-users' impairments**, focusing on the accessibility and usability issues in order to increase the productivity of designers, product accessibility, and the associated product quality.

In order to create a society for all, VERITAS introduces accessibility support of ICT and non-ICT products and services, on the basis of innovative simulation-based virtual reality testing at all stages of assistive technologies product design and development. Addressing the fundamental desire to fully understand the needs of the target users (handicapped persons); **VERITAS** creates a realistic virtual persona immersive simulation platform for the developers/designers with the ultimate goal to make them feel like impaired users, when using the products/services under consideration.

6.2 Expected Impact as listed in the EC Work Program

Expected Impact 1: "Generalized accessibility support through ICT tools within future ICT and non ICT products and services, for people with disabilities and functional limitations".

The European Union has a three-fold approach towards overcoming discrimination and increasing the inclusion of vulnerable and marginalised groups: increasing access to mainstream services and opportunities, enforcing legislation to overcome discrimination and, where necessary, developing targeted approaches to respond to the specific needs in each group³.

In this line, **VERITAS** focuses on the diverse experiences that different people with disabilities have regarding their access in every environment. Meeting a wide variety of impairments through the formation of **extremely innovative virtual user models** and proposing a wide variety of solutions for built-in accessibility support to ICT-based and non-ICT products and services, understandable by people with cognitive impairments and usable by people with visual, hearing, cognitive, speech, physical and mobility limitations, **VERITAS** will achieve to facilitate the life of almost all mainstream ICT and non- ICT products' consumers.

Primarily, **designers** will be supported at the whole lifecycle of the product design and development process through the VERITAS virtual reality simulation and testing platform. **VERITAS** tools will offer them the unique opportunity to feel and understand the needs of handicapped users effectively enough, allowing them to provide the assistive technologies market with trustworthy and usable tools addressing the real needs of the real users. Thereafter, the systems and methodologies introduced by the designers will be used by developers of accessible products.

³ Inclusion of Vulnerable Groups (http://ec.europa.eu/employment_social/spsi/vulnerable)

³ Eurostat year book 2008

The **VERITAS proposed design process** of ICT and non-ICT products/services that cater for people with different disabilities and functional limitations in different application areas will **ensure the general access** to mainstream ICT and non-ICT products/services, as it aims to:

- **Provide fully and friendly access to information** through commercial ICT and non-ICT products/services, concerning a **wide range of application areas** such as: home, workplace and entertainment. Coping with the demands of these applications is critical for the independent living of people with physical and/or cognitive difficulties;
- **Promote built –in accessibility support** in mainstream ICT and non- ICT applications by supporting designers and developers at all stages of the product development via the use of the VERITAS realistic simulation and validation system.

Conclusively, **developers/designers** are expected to benefit from the **VERITAS** innovations, as the project envisages to:

- **Propose a tangible and open simulation and testing solution** and improve the quality of software methodologies and tools, as it enables the developer to test and experiment on new or alternative interaction concepts using the large variety of virtual users;
- **Introduce an advanced software accessibility testing platform, usable without the need of low-level programming**, which will inevitably attract designers and developers, interested to focus on the most critical issues over the accessibility of the prototype;
- **Offer the potentiality to test** the product even **in the design phase** so as to ensure a positive and realistic outcome;
- **Minimize the need to include a large number of real users** in the testing and assessment of the prototype, which will be based on VR simulation and testing with virtual user models;
- **Provide rapid, automated and cost effective prototyping** (especially of the user interface functionalities of the developed application) using the desired number of virtual users;
- **Provide sufficient feedback and high quality metrics** for the evaluation and verification of the products/services through the availability of the large pool of virtual users, envisaged to comprise the test-bed subjects for the simulated accessibility evaluation;
- **Minimize the errors by design** through the usage of the virtual user testing at early stages of the product development process and target for the optimum result in products/services development in terms of accessibility support;
- **Offer innovative alternatives** by the development of an open library of various categories of user and simulation models along with a n immersive simulation platform, for virtual persona testing (putting the designer/developer in the position of the user).

Expected Impact 2: “Strengthened global position of European industry in assistive technologies”

VERITAS introduces a number of new commercial products and platforms. Thus, it will largely contribute to **strengthen the European industrial position**, since it enables the developers to further improve their products and build innovative services upon them. In this line, VERITAS virtual reality concept could be **an essential basis for the evaluation of future assistive technologies** and devices proper for all, but mainly for the consumers with disabilities.

Among the **VERITAS** economical objectives is the significant reduction of the assistive technologies' cost for users with disabilities. **VERITAS** achieves to provide a **less expensive accessibility solution** through:

- The **virtual reality simulation and testing concept**: software products designed on the basis of the virtual model, will minimize the need for real-user testing sessions as much as possible;

- The **usability concept: VERITAS** modifies the existing usability methods in order to make them applicable to new design/development verification concepts such as the testing through VR simulation.

The economic impact of *VERITAS* is expected to be huge as the products and services that people need to use in everyday lives represent an enormous business opportunity. The **wide accessibility and usability testing concepts** of *VERITAS* on almost the whole range of ICT as well as non-ICT products, in combination with the fact that the population with disabilities and its needs for socio-economic integration are constantly increasing, leads to the expectation that *VERITAS* will have a large economic potential. Accordingly, the innovative product accessibility testing solution will:

- Promote employment growth by the availability of precisely adjusted ICT and non-ICT products and services to individuals' needs and requirements;
- Provide faster development of information technology (IT) products since the principal goal of *VERITAS* is to maximize the quality and minimize the effort of making products and services accessible;
- Offer products and services that are envisaged to enable people at risk of exclusion to access and use ICT and non-ICT products and services in an affordable manner, bridging the digital and non-digital gap for particular social groups;
- Increase total IT investments in assistive technologies.

6.3 European Added Value

The current state of the art in accessibility issues reflects fragmented approaches towards the production of accessible products and services in Europe and worldwide. Thus, accessibility of mainstream ICT and non-CT products and services has to be extended by combining knowledge and extremely innovative solutions. *VERITAS* will overcome the shortcomings in accessibility support and the fragmented approaches that currently exist regarding accessibility issues. It will significantly contribute to the global problem of exclusion, stimulating for technological innovations in the ICT and non ICT field.

The *VERITAS* comprehensive approach for fully accessible ICT and non-ICT products addresses exactly the issue of embedded accessibility in future products and services, through the holistic framework that supports virtual user modelling, simulation and testing at all development stages, focusing on the realistic and immersive experience of the simulation. By providing software developers and organisations with the innovative concept of virtual reality simulation and testing, empowering them with generic instructions, new concepts, interfaces and testing virtual prototypes, the competitiveness of Europe's software products and services in this innovative market will be increased.

European added value expected by the introduction of *VERITAS* includes:

- **Exploiting and leveraging the current state of the art** scattered over various excellent industrial and academic organisations in Europe, by integrating their R&D results in the *VERITAS* build-in accessibility support platform;
- **Integrating a wide range of services and tools** that will ultimately ensure accessibility, usability, and quality of future ICT and non-ICT product developments in Europe;
- **Encouraging the definition of standards at an European level**, empowering the Community on accessibility approaches in various application domains;
- **Meeting the European deficiencies with regard to accessibility issues**, thus overcoming social exclusion at a European level.

References

1. Annex I-“Description of Work”, VERITAS project, No 247765, Seven Framework Programme, Accessible and Inclusive ICT (objective FP7-ICT-2009-4)

Appendix 1: Coordinator and Technical Manager Contact Details

Project Manager Contact details

Name	Dr. Manfred Dangelmaier
Organisation	Fraunhofer IAO, Universität Stuttgart IAT
Address	Nobelstr. 12, 70569 Stuttgart, Germany
Telephone	++49 (711) 970 2107
Fax	++49 (711) 970 2299
E-mail	manfred.dangelmaier@iao.fhg.de

Technical Coordinator contact details

Name	Dr. Dimitrios Tzovaras
Organisation	Centre for Research and Technology Hellas Informatics and Telematics Institute
Address	6th km Charilaou – Thermi Road 57001 (PO Box 60361), Thessaloniki, Greece
Telephone	+30-2311-257777
Fax	+30-2311- 257707
E-mail	Dimitrios.Tzovaras@iti.gr

Appendix 2: Short Project description

I. PROJECT INFORMATION

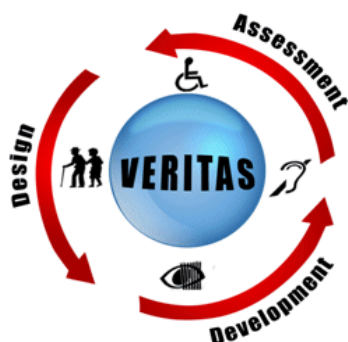
Project acronym: VERITAS

Project name: Virtual and Augmented Environments and Realistic User Interactions To Achieve Embedded Accessibility DesignS

Contract number: 247765

Priority component: Accessible and Inclusive ICT (FP7-ICT-2009-4)

Project Logo:



Project Web Site: <http://veritas-project.eu/>

List of participants:

No.	Participant Organisation Name	Participant Short Name	Country
1 (Coordinator)	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.	Fraunhofer	Germany
2	Centre for Research and Technology Hellas	CERTH	Greece
3	Fimi s.r.l	FIMI	Italy
4	Instituto de Aplicaciones de las Tecnologías de la Información y de las Comunicaciones Avanzadas	ITACA	Spain
5	Centro Ricerche Fiat Società Consortile per Azioni	CRF	Italy
6	Foundation for Research and Technology Hellas	FORTH	Greece
7	Continental Automotive France SAS	CAFS	France
8	University of Newcastle Upon Tyne	UNEW	United Kingdom
9	Scuola Superiore Di Studi Universitari e di Perfezionamento Sant'Anna	PERCRO	Italy
10	La Plateforme Europeenne Des Personnes Agees et Retraitees	AGE	Belgium
11	BYTE COMPUTER SA	BYTE	Greece
12	RE:Lab srl	RELAB	Italy

No.	Participant Organisation Name	Participant Short Name	Country
13	Università degli studi di Trento	UNITN	Italy
14	Virtual Reality & Multi Media Park S.p.A.	WRMMP	Italy
15	Marie Curie Association	MCA	Bulgaria
16	Ceske Vysoke Uceni Technicke v Praze	CVUT	Czech Republic
17	Universität Basel	COAT	Switzerland
18	Indesit Company S.p.A	INDESIT	Italy
19	DOMOLOGIC Home Automation GmbH	DOMOLOGIC	Germany
20	LMS International NV	LMS	Belgium
21	ATOS Origin Sociedad Anónima Española	ATOS	Spain
22	Asociación de Investigación de la Industria de juguete, conexas y afines	AIJU	Spain
23	Piaggio & C. S.p.A.	PIAGGIO	Italy
24	Smartex s.r.l.	SMARTEX	Italy
25	Human Solutions GmbH	HS	Germany
26	Bauunion 1905 GmbH	BAUUNION	Germany
27	Hypertech S.A.	HYPERTECH	Greece
28	I+ srl	I+	Italy
29	University of Salzburg	US	Austria
30	Brunel University	BU	United Kingdom
31	Universidad Politécnica de Madrid / Life Supporting Technologies	UPM	Spain
32	Universität Stuttgart	USTUTT	Germany

Total project cost: 11,678,787.00 €

Commission project funding: 8,000,000.00 €

II. PROJECT MAIN GOALS

The core concept of VERITAS EC project is to research and develop an open framework for providing built-in accessibility support at all the stages of realisation of mainstream ICT and non-ICT technologies. The project aims at delivering to product/software developers 'generic' instructions - embedded in an empowering virtual reality platform, for exploring new concepts, designing new interfaces and testing interactive prototypes that will inherit universal accessibility features, including compatibility with established assistive technologies. By achieving these goals VERITAS is expected to operationalise and potentially revolutionise the accessibility testing at all stages of design and development of new products in five very important industrial domains (automotive, smart living spaces, (buildings & construction, domotics), workplace and infotainment applications areas). The main VERITAS innovation lies in the fact that, even if there have been some limited and isolated attempts to support accessibility testing of novel products and applications, there is a clear lack of a holistic framework that supports comprehensively virtual user modelling, simulation and testing at all development stages and realistic/immersive experience of the simulation.

Specifically, VERITAS will develop:

- An **Open Simulation Platform** (OSP) for testing at all development stages that will provide automatic simulation feedback and reporting for guideline/methodologies compliance and quality of service.
- Detailed **physical, cognitive, behavioural and psychological virtual user models** as well as the corresponding simulation models to support simulation and testing at all stages of product planning and development.
- Accessibility support tools at all the stages of **iterative planning and development** (i.e. specification, design, development, testing, and evaluation) for the five application areas.
- **Virtual simulation environments for ICT and non-ICT products offering tools** for testing and verification mainly at the design stage but also during the development stages when links to ICT technologies are implemented.
- **A VR simulation environment** for realistic and iterative testing providing simultaneous multimodal (visual, aural, etc.) feedback to the designer/developer as well as the potential for immersive realistic simulation and virtual user testing (i.e. the developer taking the role of the end-user).
- A simulation environment which will support **multimodal interface virtual testing** in realistic scenarios. This will offer the opportunity to fine tune and adapt these technologies to the specific application.

The **ultimate vision of VERITAS** is:

- To translate the accumulated knowledge on ICT accessibility to parameters of the virtual user models and simulation models for a variety of applications;
- To test the validity and applicability of virtual user models in real accessibility testing scenarios using an innovative multisensorial platform;
- To create a set of simulation models building on the experience already gathered via testing accessibility in various applications domains;
- To integrate all the above into VERITAS knowledge, which will serve as a reference to the existing ICT accessibility know-how.

As well as serving well many of the general objectives of the ICT Work Programme 2009, the project mainly targets the expectations of Challenge 7: ICT for Independent Living, Inclusion and Governance with a specific focus on the Objective ICT-2009.7.2: Accessible and Assistive ICT, target outcome a) Embedded Accessibility of Future ICT, of the 7th Framework Programme.

III. KEY ISSUES

VERITAS will introduce accessibility support tools at all the stages of iterative planning and development (i.e. specification, design, development, testing, and evaluation) and for five new application areas. VERITAS aims at introducing embedded accessibility: developing groundwork, creating infrastructure and establishing standards in the following important domains:

- Design and developer tools.
- ICT and non-ICT solutions with special emphasis in the following domains:
 - Automotive
 - Smart Living Spaces
 - Workplace
 - Infotainment
 - Personal HealthCare and Well-Being

VERITAS will be validated under five different and complex scenarios in the industrial development chain and, moreover, the results of the project will affect designers and developers to prioritize accessibility and disability issues in the design and development of every product development. VERITAS through the virtual user concept is expected to prompt the accessibility support at a global level as well. The VERITAS framework could contribute to the Universal Design Principles, by providing design examples that would facilitate the usability of all types of products and environments.

The availability of a large pool of virtual users, who are envisaged to comprise the sample of the test-bed for simulated accessibility evaluation of VERITAS, is expected to provide sufficient feedback and high quality testing, evaluation and verification of products/services.

VERITAS mainly addresses 2 main categories of end users:

- Designers and developers of ICT infrastructure, applications and services – referred to hereinafter as “**developers**” (target user group);
- People with disabilities (including older people), who experience one or more of the following mild to severe impairments:
 - Blind and low-vision impairments
 - Motor impairments
 - Cognitive impairments
 - Hearing impairments
 - Speech impairments.

IV. TECHNICAL APPROACH

The VERITAS Integrated Project is expected to build **an open and generic framework for immersive virtual user simulation and testing**. VERITAS will offer a **virtual reality simulation environment** for realistic and iterative testing providing simultaneous multimodal (visual, aural, etc.) feedback to the designer/developer as well as the potential for immersive realistic simulation and virtual user testing (i.e. the developer taking the role of the user). In addition, the VERITAS Framework through multimodal interfacing technologies will enable assistive technologies and devices (ATs) to be integrated in the User Centred Design process in order to support developers to optimise and make more efficient the whole process of User Interactions Design with ATs, as well as to validate Usability and Accessibility at all development stages.

The **virtual reality** concept introduced by VERITAS as supported and designed on the basis of the virtual user modelling, will minimize in future the need for real-user testing sessions for UCD design and

development processes. Thus, an advanced **virtual user modelling procedure** will be developed so as to allow the parameterized modelling of the users with disability through the VERITAS Integrated model Generator and the Intelligent Avatar that will enable the VERITAS platform to perform an automated generation of **parameterized user models**.

The **VERITAS multisensorial platform** will enhance the creation, validation and training of **virtual user models** through the participation and involvement of real users with disabilities within the VERITAS consortium. The platform will utilize interaction of real users in the virtual environments, in terms of their behavioural and physiological response, to tune the virtual models and provide sufficient feedback for the quantitative evaluation and verification of the user models. The availability of a large pool of virtual users that are envisaged to comprise the test-bed subjects for the simulated accessibility evaluation of VERITAS is expected to provide sufficient feedback and high quality testing, evaluation and verification of the and potential products/services.

VERITAS will support a **multimodal interface virtual testing** in realistic scenarios that will offer the opportunity to fine tune and adapt these technologies to the specific application domains. In this respect, full advantage of the multimodal interface technologies is expected, fully exploiting the concepts of cross-modal transformation and temporary modality replacement.

V. EXPECTED ACHIEVEMENT / IMPACT

Specifically, most of the ICT products are partially accessible or accessible only through external assistive devices. Most of the new technologies are designed by people without disabilities, not fully aware of the real problems, needs and abilities of the impaired. Consequently, the lack of built-in accessibility support at all stages of implementation of mainstream ICT and non-ICT applications provoke **social exclusion** and **isolation** for people with disabilities.

The **main objective** of VERITAS is to **increase the accessibility** of ICT and non-ICT products and services in Europe. It will focus on removing barriers caused by inappropriate design and development of products and services, which hinder particularly people with disabilities and the older people.

Attempting to address every systemic form of discrimination, **VERITAS** provides the designers/developers with the potentiality to achieve realistic and iterative user testing at all development stages and thus, to offer mainstream ICT products/services, compatible with assistive devices and adjusted to visual, hearing, cognitive and mobility impairments. By covering almost every disablement, it proposes the **verification of the product through VR simulation of the end-users' impairments**, focusing on accessibility and usability issues in order to increase the productivity of designers and the accessibility and the associated quality of their products.

In order to create a society for all, VERITAS introduces accessibility support of ICT and non-ICT products and services, on the basis of the innovative simulation-based, virtual reality testing at all stages of assistive technologies product design and development. Addressing the fundamental desire to fully understand the needs of the target users (handicapped persons); **VERITAS** creates a realistic virtual persona immersive simulation platform for the developers/designers allowing them to design products/services from the handicapped user perspectives.

VI. COORDINATOR CONTACT DETAILS

Dr. Manfred Dangelmaier

Fraunhofer IAO, Universität Stuttgart IAT

Nobelstr. 12, 70569 Stuttgart, Germany

Tel: ++49 (711) 970 2107

Fax: ++49 (711) 970 2299

E-mail: manfred.dangelmaier@iao.fhg.de