THE IMPACT OF WEB3D SOLUTIONS FOR PRODUCT DEVELOPMENT E-LEARNING

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ABSTRACT
Knowledge is embedded in people and unlike information, knowledge creation occurs in a process of social interaction. As our service-based society is evolving into a knowledge-based society, there is an acute need for more effective collaboration and more effective knowledge sharing systems for use by geographically scattered people. Starting from the work made with the Leonardo da Vinci Project "3DWebEPL", the paper proposes a structured analysis for investigating the use of Web 3D components and standards for e-Learning purpose in the product development context.
Keywords: E-learning, Web3d, Product Development

1. INTRODUCTION

The e-Learning concept originated in the corporate literature of Computer Based Training Systems in the mid-1990 and is a general term used to refer to computer enhanced learning. In the specialized literature, e-Learning designates the transfer of knowledge and education through electronic means. E-Learning involves the use of IT&C (Information Technology and Computers) paradigms, usually a physical distance between the sender and the receiver as well as teaching materials available on Intranet/Internet or on electronic supports like CD-ROMs or DVDs.

Nowadays, it is possible to notice a transition to a new Web, the "WWW space being seen more like a software platform, where the user controls and creates his own data and information, usually making them available for the others by means of collaborative instruments"[2]. Web 2.0 is an informal name for the new generation of web applications, oriented towards social needs, focused on the separation of the relevant information from the irrelevant one and on "usability tests", as it is addressed to persons

without much training in computer science, for whom the e-Learning interface should not be more complicated than the use of domestic appliances (phone, TV etc.). Web 2.0 integrates the solutions and the services of the old Web 1.5, to which it adds innovations such as: RSS, blogs, podcasts, wikis, collaborative bookmark systems, web API, web services, Ajax, Ruby-on-Rails etc.

The standards that lie at the core of e-Learning activities are based on specifications produced and developed by experts in the field of industry and education. The main benefits of standardization for the educational system are:

- **Accessibility**: it allows usage of an e-Learning object situated in a place that is connected to the system, from any other external point without actually transferring that object. The system is based on the fundamental principle that an object created and validated becomes unique;

- **Reusability**: an object or a content created in a certain place can be utilized anywhere else on the working platform;
- **Viability**: the ability of an object to be used as many times in different contexts according to the training objectives;
- **Durability**: the objects created on the basis of specific standards remain valid throughout time regardless of the technological changes.
- **Efficiency**: the standards raise the final outcome of the training process without raising its costs along with it

In the science applications context also interactivity represents a key factor for the success of the training process. This aspect in fact is correlated with the necessity of the user to acquire expertise simulating real working scenarios. This situation suggests the necessity to integrate the classical e-learning platform with the use of virtual reality technologies able to provide to the user the interactive features. A 3D virtual space brings advantages such as increased motivation on behalf of the student and increased efficiency in explaining difficult concepts.

2. WEB3D & E-LEARNING

Web-based knowledge transfer is becoming a field of research which deserves the attention of the research community, regardless of their domain of expertise, especially because of the potential of advanced technologies such as Web 3D [3]. In the context of globalised communication, these technologies are becoming more stimulating through the possibility of creating collaborative spaces for simulation and training [4]. Knowledge is embedded in people and unlike information, knowledge creation occurs in a process of social interaction. As our service-based society is evolving into a knowledge-based society, there is an acute need for more effective collaboration and more effective knowledge sharing systems for use by geographically scattered people**.**

With respect to VR systems, Web3D solutions tend to be lacking in supporting immersive hardware, but can be built at a much lower cost, and can be experienced by a much larger number of people (even in multi-user mode, i.e., navigating together the same VE). Another important aspect of Web3D solutions is the strong integration with existing Web resources.

Educational uses of Web3D technologies present a number of advantages with respect to traditional learning practices. In general, this approach can provide a wide range of experiences, some of which are impossible to try in the real world because of distance, cost, danger or impracticability. Thanks to Web3D technologies, these platforms can be made accessible anywhere there is a computer connected to the Internet. An important advantage is related with using three dimensional graphics, which allows for more realistic and detailed representations of topics, offering more viewpoints and more inspection possibilities compared to 2D representations. Another advantage is the possibility of analyzing the same subject or phenomenon from different point of views. This way, users can gain a deeper understanding of the subject and create more complete and correct mental models to represent.

3. The 3DWebEPL project

The combination of multimedia and virtual reality provide a user-friendly interface to encourage distance learning and foster new and innovative approaches to professional training connected to Enterprise Product Lifecycle (EPL). Another area where the WEB3D training approach may be

applied is a virtual manual for training of office staff. In vocational training, 3D virtual manuals are superior as the trainee can see tools and objects as they were floating around from any perspective they choose. The 3DWebEPL project promotes, using WEB3D tools and approaches, an efficient collaboration network over product development, focusing its attention on tools for sharing information and knowledge in various company divisions. The final product is a web platform for distance learning, based on 3D web technologies and usable by all the possible users on the European territory. Through the presence of modules oriented to the mechanical field, a solid competence about different techniques will be provided to SME employees, facilitating their collaboration in the development of new, more complex, and competitive products and services.

Focusing the attention on product development context this project has been implemented working on three main areas: Computer Aided Design, Finite Element Simulation and Reverse Engineering (Fig.1).
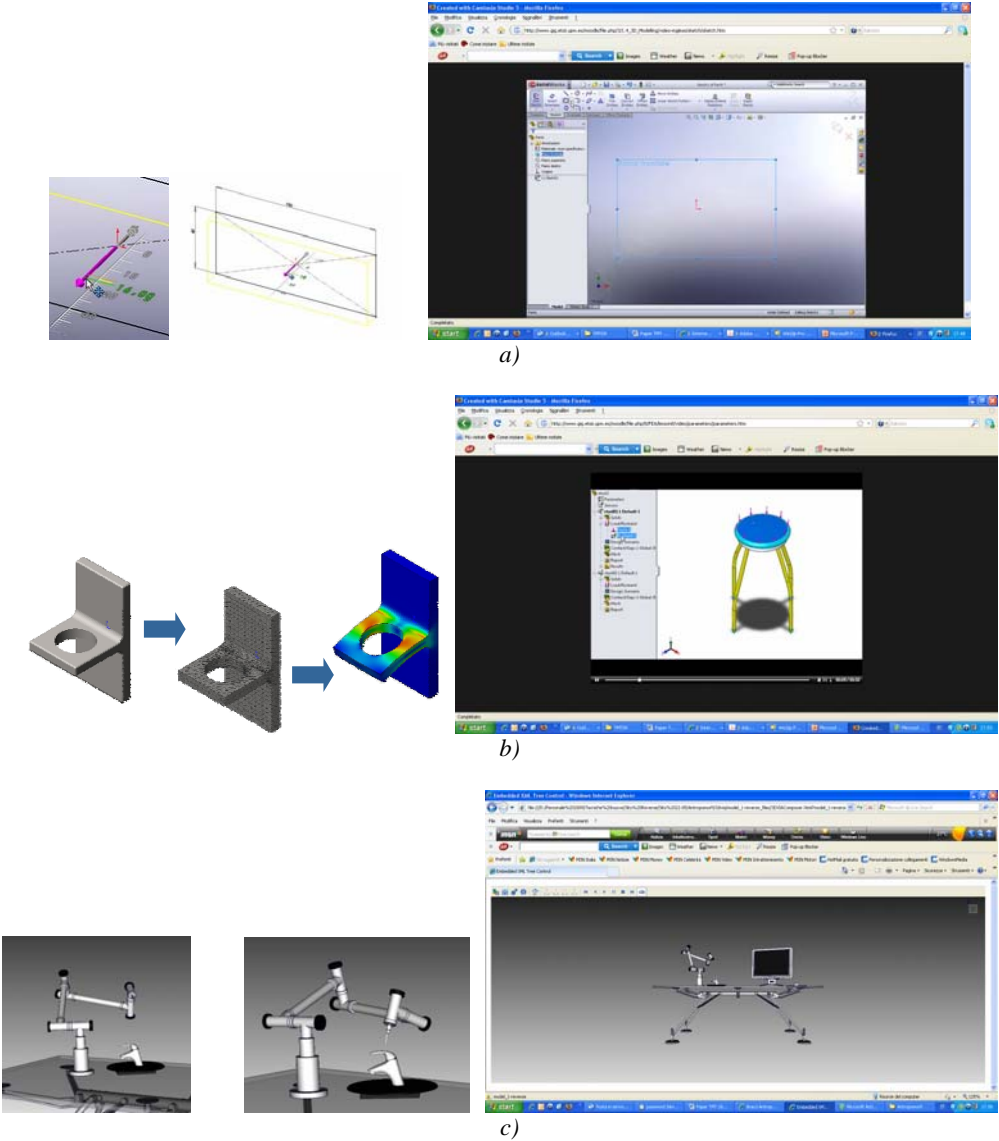

a)

b)

c)

Figure 1. WEB3D models: a) Computer Aided Design, b) Finite Element, c) Reverse Engineering

The actual global market is moving in the direction of design and development team always and always more extensive, the concept of extended enterprise, without geographical constraints. Sometimes what creates the biggest problems in this collaborative scenario are not the technological constraints, but more in the specific the cultural constraints.

For this reason in order to operatively support the collaborative product development culture the project has focused its attention on the main area concerning the product development in order to support procedures sharing without any others constraints and barriers.

6. CONCLUSIONS

3D Virtual Reality, software tools and associated Web technologies are mature enough to be used in conjunction with advanced e-Learning systems. 3D based content can enhance communication of ideas and concepts and stimulate the interest of students. Web 3D graphic tools and 3D interactive images are modern instruments for companies in the business of complex product design and manufacturing and offer full visibility into the work management process.

The technologies of visualization and of real time changes represent one of most important feature inside the PLM solutions to allow an efficient collaborative working.

The European dimension of the 3DWebEPL project will be an occasion to set the experience developed in the preceding project, exploiting and integrating different transnational skills and testing tools and formative experiences in the training of technicians and experts.

7. NOTES AND ACKNOWLEDGEMENTS

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