



Simulations

The applications of e-Learning have been considerably stratified making it possible for us to identify configurations and guidelines which have now become standardized de facto in each specific sector according to the objectives and the final destination.

Together with the distinct appearance of a profile considering the various declinations of e-Learning, emerges however with the same clarity the border zones to which e-Learning promises to make its next steps.

Among these areas – physiologically turbulent and still in the first or second stage of experimentation – particularly interesting at the moment is the world which revolves round the applications of learning by doing and of learning by playing, both conjugated with formative models generically known as “simulations”. This term however is misleading and can cause confusion because it is used by scholars, designers, users, suppliers and buyers, who often attribute to it various different meanings; to make matters worse, it is often sided by, replaced, confused or integrated with terms such as business game, serious game, e-simulation, role play, edutainment and further variances or combinations.

The special number that Je-LKS wishes to dedicate to simulations has two objectives:

- the first one is to contribute to the elimination (or at least to the reduction) of the existent ambiguities, proposing a taxonomy that scholars can share in order to give propriety of language to this area of e-Learning;
- the second one is to gather, spread and compare the most interesting and concrete experiences carried out in Italy in this field.

The studies and the experiences presented in the following pages are the result of a research carried out over the last few years at the e-Learning laboratory LABeL belonging to the CATTID of the Sapienza, University of Rome: a research centred in particular during the years 2008-2009 on the development of a taxonomy based on traditional studies about games and simulations, also

outside the world of education and the transversal one of digital publishing. It is a theoretical research which found its territory of activity and its verification in the systematic confrontation with the majority of the designers, the employing parties and the developers of simulations working in Italy¹.

In order to explain the context and the reasons why we carried out last year the research at the LABeL CATTID of the Sapienza and we are now presenting this focus of Je-LKS on simulations, and before talking about the theoretical and practical contributions of the papers gathered in this special number of our journal, I would like to share with you the observations and the questions which gave birth to our work.

First point: why this interest for simulations? Our research group followed the outline here presented:

1. in the panorama of e-Learning the use of simulations instead of traditional learning systems in presence represents a step towards a less deterministic approach: we could say a more “complex” approach, in which by complex we mean a problem (and a system) where many independent elements capable of creating patterns, unpredictable a priori, operate at the same time and in a non-linear way (of another kind are instead the so called “complicated” elements and problems, which are by definition “simplified” in “linear” sequences without losing the typical characteristics that emerge from a system which is complex in its development).
2. By using simulations it is possible to recover the oldest and the most consolidated ways of learning of the human species (and in general of the organisms created by evolution): those based on the immersion of the subject in the environment to discover and to experiment with.
3. This recovery is possible in a substantial and profound way only nowadays thanks to the spreading and the global penetration of digital tools, which permit the creation of virtual environments capable of involving (“cheating”) our senses by using the levers of multimediality and of interactivity.
4. Innumerable are now the researches and the studies which have measured the efficiency, the effectiveness and liking of simulations, recognizing their objective superiority to the traditional courses based on Wbt as to what concerns the permanence and the applicability of the knowledge absorbed in the different sectors of learning, starting from

¹ The 11 meetings “Simulazione: best practices” (“Simulation: best practices”) were held in the Conference Room of the Cattid, Sapienza, University of Rome between February and May 2009. The list of the meetings and the materials used (reports and downloadable PPTs) can be found on the “Label Journal” website at the address <http://www.labeljournal.it/site/index.php?module=News&catid=&topic=5>

the behavioural one.

Besides the technical and methodological aspects (3. and 4.) and the recovery of the old way of learning (2.), what we wish to stress – among the reasons simulations are so interesting for us – is the consideration (usually unsaid or put aside) that these can represent a complex (non linear) response to the insertion of the subject who learns in a social scenario that not only shows growing attention for non linear and adaptative phenomena, but sees itself also increasing its own level of complexity, with an equally growing awareness of the limits of application of deterministic tools and visions (though they are still precious today and will continue to be in the future in problems of a purely technical kind). It is on these considerations that the paper here presented by Domenico Parisi has been based. Its title is “Only technology can save our schools”.

Let's pass now from the “why” to the “what” and “how”. This way we reach the second point: what kind of products/services can we find under the all-embracing umbrella of the term “simulation”?

The core of the problem – with its theoretical origins which date back to the classic studies of Huizinga (1939) and Callois (1967) and reach our days with the works of scholars such as Aldrick, Parisi and Antinucci – is faced in the papers presented in this special number of Je-LKS by the research group of LABeL in Rome (Botte, Matera and Sponsiello: Serious Game, between simulation and game. A proposal of taxonomy). In brief we can say that the studies carried out by this research group have made it possible to represent in profile two big families – rather distinct – of simulations: those that we will call “Lab Sim” and those that we will call “Tale Sim”. Here is a synthetic profile:

LAB SIM: simulator as a technological device for the manipulation of a model; we refer to virtual laboratories (modelled, simulated) where the phenomena the user observes, explores and analyses to gain a profound knowledge of the internal mechanisms of the process in exam, develop by themselves (according to physical laws or evolutionary paths), on the basis of parameters manoeuvred by the user: the learning phase (as Franco Landriscina clearly explains both in his book and in the article “Simulation and learning: the role of mental models” you can find in this number) is distributed between briefing, observation and subsequent analysis, reflection and/or discussion, according to assessments and guide lines previously planned by the instructor.

The keywords of the Lab Sims are: “simulated laboratory”, “laboratory simulations”, “user as an external observer”.

The models (the engines) are for the most part based on cellular agents and automatons or on dynamic systems (n equation systems in n variables with p parameters manipulable by the user); models based on tree shaped or table systems are not suitable to Lab Sims.

The interface is normally made up of panels representing the phenomenon under exam and the course of the reference variables; 3D constructions, immersion environments, augmented reality in this case are not required.

Fruition is generally single or in small work groups; Lab Sims are not suitable for massive use on the web.

TALE SIM (or Personal Sim): learning environments based on personalized simulations; we are talking about simulations to inhabit, to live, to cross, to explore personally (in subjective, as an avatar or in third person). The user is the actor (or one of the actors) of the story and/or of the environment to explore; it is an explicit formative path (on the contrary of what happens in the Lab Sims); learning can take place or by surfing personally inside the story and/or virtual environment (more or less immersive), or by interacting on the web with other people or avatars present in the environment; also in the Tale Sims, as in the Lab Sims, the learning phase often (but not always) ends with a de-briefing.

The Tale Sims' keywords are: "simulation as a stage, as a theatre", "participated simulations", "simulated personal experiences".

The models (the engines) are for the most based on dynamic systems and on tree shaped or table models (as a rule no model based on cellular automats is used).

The interface is normally made up of 2D and 3D explorable environments, of immersive environments, of augmented reality (but also of panels for the management of the variables in the specific case of business and serious games).

Fruition is generally individual (or in small groups) in the offline Tale Sims; it is generally individual but massive in the case of online fruition.

But, within this division in two families, where do we position the serious games? And the business games? And the massive online role games? And the flight simulators? All these cases are categorized in Botte's, Matera's and Sponsiello's article, and some of them are described in detail in the other articles of this special number.

THE PAPERS

As we can understand from what has already been said, this special number about simulations is made up of a central nucleus of three theoretical, methodological and foundational articles. These are the contributions of Domenico Parisi (Only technology can save our schools), Franco Landriscina (Simulation and learning: the role of mental models) and Botte, Matera and Sponsiello (Serious Game, between simulation and game. A proposal of taxonomy).

There are then a series of contributions which allow us to consider the practical applications, the experiences effectively lived by the developers, the employing party and the designers of different kinds of simulations.

Roberta Costantini (Management of teaching simulations with an authoring tool) presents a planning methodology developed within her work group which consists of an authoring system based on the use of Bayes' net to widen and render versatile the responses that the system can provide during the creation of a personalized story.

Vindice Deplano ("Learning bricks": re-usable objects for effective simulations) considers the subsidiary aspect of the problem: instead of dealing with the engine, he considers in fact the optimization of the production of re-usable graphic resources (in particular for interfaces) in order to cut costs which are always too high in simulations and especially in business games.

Silvia Di Marco (Project-based course in experimental physics. Simulation of a real-life R&D program) discusses a specific case study, both to analyze its concrete aspects and to identify the guidelines and the points of strength of the use of simulations in particularly congenial sectors such as the teaching of experimental physics.

The picture is completed with two contributions of Lucia Pannese: the first one, written in collaboration with Sonia Hetzner (E-Vita, life simulations in an intergenerational setting), presents this project financed as a case study to define the formative approaches based on serious games, and in particular the use of storytelling in their development; the second (Learner Modelling: Optimizing Training, Assessment and Testing) in instead a more general reflection on the real possibility to develop a strong personalization of educational models thanks to the use of tools typical of complex adaptative systems, such as fuzzy classifiers and evolutionary algorithms.

Roma, 9 September 2009

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This number of the journal is completed with other papers:

Alfredo Cutolo, Carmine De Nicola and Anna Pierri (The phenomena of impact seen through an experiential application), describe their experience in the creation of didactic materials based on simulation experiments in the ambit

of the physics of elementary particles.

Maria Ranieri, Giovanni Bonaiuti, Antonio Fini and Pierfranco Ravotto (Mobile learning for the integration of groups that risk being marginalized) present the project ESEMBLE, which aims to favour the socio-cultural integration of immigrant citizens by using mobile technology.

Anna Chiara Desiderio, Valentino Vitale, Valentina Piccolo, Gaetano Esposito and Filomena Faiella (Teaching in virtual worlds: Educational experiences in Second life) describe the results of an experiment carried out inside the environment Second Life to understand how a few Italian universities use the potential of this virtual context.

Finally, there is Guglielmo Trentin's paper (The WISE project), the start off of a project which will try to improve the access to education of disabled users.

Trento, 11 September 2009

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