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Section 3
Chapter 14 - From Videogames to Work: Interactive Languages and Three-Dimensional Environments as Refernce Models in Tomorrow's Professions.

Theoretical Framework

14.1: Video games, intelligent machines and innovation

The videogame fully embodies the digital technological revolution, often representing its most advanced tip, requiring applied research, large investments and multidisciplinary and at the same time highly specialized teams. Video games are sophisticated and highly advanced cultural and technological creations. The release of a video game often coincides with a recognizable technological innovation; innovation that is an integral part of the very history of video games.

14.1.1: The gameplay: from storytelling to experience

Video games have particular characteristics that make them unique in history and in the current media landscape. The language of the "game experience", the *gameplay, is* something radically different from the traditional narrative forms. In fact, it can be said that this *medium* goes beyond the millenary model of narration, a paradigm that has always been the basis of books, theatre and cinema.

"*A game designer doesn't create technology. A game designer creates an experience*" (K. Salen, E. Zimmerman, 2011). One of the fundamental characteristics of video games is that they don't tell a story but require players to "tell" it, or rather to create it through their interactive activities. In

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video games, the player modifies the outcome of the story with each action. In the videogame we pass from listening to action: we act and interact continuously. Like in life, like at work. Not like in the traditional school, based on a frontal teaching model with a low degree of pupil involvement. Transforming didactics from narration to experience, from passivity to interactivity, is also one of the objectives of our V4T project. The intense, engaging interactivity distinguishes video games from other forms of media entertainment and traditional forms of teaching.

Video game interactivity takes the user into a new dimension, seducing him like no other previous *medium*. The immersive and engaging *gameplay,* translated into the world of learning and work, has potential yet to be explored.

14.1.2. Video games and scientific method

Cognitive scientist Steven Johnson compares the cognitive activity of a player in a video game to the scientific method (Johnson, 2006). In fact, in a game practical experiments are carried out that determine precise consequences: by changing the factors involved, you get different results.

This cognitive process is sometimes considered a problem for a gamer at school age, as the abstract notions coming from a teacher may not be assimilated by a young person accustomed to these "practical" learning procedures derived from video game simulators. But simulators will become more and more common in everyday experience, and we will have to learn how to make the most of them. Therefore, even school education will increasingly have to teach the use of intelligent tools that use the scientific method. The metaphor of the “driving navigator” will soon expand to other areas of life, and digital assistants will be increasingly present in our existential *gameplay*.

14.1.3. Playing with artificial intelligence

The events of the *gameplay* depend on the choices and actions of the player who interacts with the artificial intelligence of the videogame. This new interactive experience between user and

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videogame algorithms anticipates the relationship between men and intelligent machines, that is the basis of the professions of the future.

The advanced ways of working and the professionalism required by video game producers are probably a model for many of the professions of tomorrow. Digital transformation is upsetting many disciplines increasingly influenced by automation and artificial intelligence. Our existential dimension, with the spread of the Internet of things and augmented reality, increasingly resembles a video game, inhabited by objects carrying information and equipped with features that can interact with us. It is now established that the work of the future will be based on the ability of men to interact and exploit intelligent machines, in a kind of real-world *gamification*.

14.1.4. Game simulations and professional simulations

"Simulation games, which belong to the category of mimicry put forward by Caillois, have to do with the "not for real" aspect of the games that ethologists focus on" (Savignac, 2016).

A simulation game is based on the reproduction of the rules of the real world. Anyone who plans such a game knows that the player also wants to invest hours of time to learn something new; for example, he learns a driving game with the real representation of the road, or to use a fighting game where you need to learn the moves of a martial art. In these games learning is fun. Much software that simulates creative activities is not very different.

The new simulators in various professional fields are based on ergonomic paradigms similar to those of video games. The most advanced video games develop simulations of existential contexts, real or imaginary. Apparently, they're a long way from work. Yet in some cases some video games are extremely similar to professional tools, as in the case of flight simulators or driving. The robot surgeon *Da Vinci* is an excellent example, which allows microsurgery operations to be carried out that are impossible with bare hands. The surgeon leaves the scalpel and observes his work area on a viewer connected to cameras that frame the anatomical part on which he is operating, using two servomechanisms that he uses with two interfaces similar to *joysticks*. In this way, his professional experience is mediated by an intelligent machine, with sensors superior to those of humans. The

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surgeon must abandon his traditional manual skills, which worked directly on the tissue, and operate in a virtual form, as in a video game.

Video games are actually not stories but virtual contexts to live lives, which are fragments of our real life even if transferred to a Virtual Reality. In these virtual existential fragments, professional experiences such as those of a surgeon can be easily included. Being able to turn work into a game, in which continuing to learn because it is pleasant and rewarding, is one of the most fascinating challenges of the 21st century.

14.2: Learn digital in a professional key

If the effectiveness of digital *devices* as a form of learning is the subject of debate today, it is certain that digital *devices* will be fundamental in tomorrow's professions. We do not know much about the professions of the future, but we can be sure that the relationship with technology will be decisive in many professions that will quickly replace the current ones. Many analysts say that in a few years, due to the expansion of digital technology and artificial intelligence, most of the professions we know will disappear.

The current critical condition of youth employment calls for a new challenge for schools: to prepare children for an uncertain future, in which many of the skills of the past are in danger of becoming obsolete.

14.2.1. Applications for lifelong learning

In the age of lifelong learning, which is subject to continuous technological evolution, the figure of the professional trainer will be increasingly in demand. Producing interactive experiences is complex and requires skills that are contiguous to the world of video games. It is not easy for companies to produce interfaces and content for digital training; for example, specialists are

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needed who can adapt the many contents already in the company's possession, such as 3D models of products developed by designers with CAD CAM systems.

For the efficiency of professional training applications, the design of the interface and of the contents, which can be more or less complex to produce, through the use of new interactive representation systems, as in the case of Augmented Reality, is fundamental. AR is basically a tool for introducing digital and artificial intelligence into everyday reality, equipping people with the extraordinary functionalities offered by these technologies. AR (*Augmented Reality*):

- places the web in a three-dimensional space;
- lays the web out on reality, freeing it from the two-dimensional page;
- produces an experiential fruition of the web;
- is a digital interface that interacts with real objects;
- is based on a "*digital twin*" of real objects.

The so-called *digital twin* collects and lays out the information created by CAD or 3D scans and organizes it in a three-dimensional model, redefining the relationship between the worker or customer with the product.

A recent research carried out by Capgemini - a company operating in the fields of IT consultancy and professional services - and entitled "*Augmented and Virtual Reality in Operations*"[1], analyzes the induction of Virtual and Augmented Reality in enterprises. According to Capgemini, immersive technology already has a significant impact on businesses, especially in the US and China, and will continue to evolve in the coming years. According to the study, of those companies that are not yet exploring AR/VR, 50% expect to do so within the next three years.

Capgemini identifies the following main areas of implementation:

- *Design and assembly*: digitally experiment with the design and operation of a resource; test and modify the model before completion;

1 https://www.capgemini.com/wp-content/uploads/2018/09/AR-VR-in-Operations1.pdf

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- *Immersive training*: use virtual reality to enable simulation of activities in a safe and/or digitally driven environment;
- *Inspection and quality assurance*: enabling faster and more in-depth monitoring and inspection through the display of information;
- *Repair & Maintenance*: use real-time views and information to help you complete a maintenance or repair task.

14.2.2. *The* digital twin *of the product*

Industries have long been designing and producing objects using digital product models, created by designers and then entrusted to automated production chains.

These "digital twins" of products today increasingly go beyond the production chain and are also used in the world of marketing, maintenance and professional training. Three-dimensional product models can, for example, be used by users as configurators to customize the products themselves.

This practice is very common in video games, which are in fact often equipped with configurators dedicated to characters, clothes, weapons or landscapes; what until now was the domain of games, is rapidly becoming common for many professionals and is being affirmed in many economic sectors.

In addition, video games also use three-dimensional models for learning the mechanisms of play: many complex games in fact need a learning phase. Understanding today how to develop a tutorial based on a three-dimensional model that simulates an object, an environment or a real situation, may be useful tomorrow, when the instructions for use of any product will be three-dimensional, thanks to the affirmation of augmented and virtual reality, both focused on the concept of *digital twin*.

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14.2.3. Industrial areas most affected by Augmented Reality

Another recent research[2] - from the Harvard Business Review - identifies the percentages of AR use by industry type:

1 - *Automotive*

2 - *High tech, telecommunications and media*

3 - *Medicine*

4 - *Retail and consumer*

5 - *Manufacturing*

6 - *Energy*

The research describes the main areas of application in the various moments of corporate life, from design to production, from logistics to *marketing* and sales.

14.2.3.1. Corporate training

Training, instructions for use, guides in *real time*, are essential applications. Guides and user manuals in augmented reality (*onsite*, *real time*, *step-by-step*) are very effective in the assembly of products, in operations with machines, in warehouses. Boeing is one of the fundamental *case histories*: with the transition from paper drawings to AR, the company saves 35% of the time, for new recruits 90%. The Harvard Business review analysis highlights the importance of educational, training, guidance and assistance activities.

14.2.3.2. Remote assistance

Remote assistance is a key area for many industries. Virtual Reality (VR) can be combined with Augmented Reality (AR) if you need to view distant places, in other historical periods or on another scale. VR is also important for creating multi-user environments, such as the virtual design environment shared by Ford designers, with the car hologram in CAD. The U.S. Civil Protection is

2 A MANAGER'S GUIDE TO AUGMENTED REALITY by Michael E. Porter and James E. Heppelmann, Harvard business review 2017

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using Virtual Reality in training to simulate risky environments, BP for oil platforms. VR has been successfully used by construction companies for construction site simulation and real estate sales.

14.2.3.3. Designing

Three-dimensional models have long been fundamental to the design industry: increasingly sophisticated CAD models of products are developed by designers from manufacturing companies. A real process of 3D reproduction and digital simulation of many working areas is underway. The case of the building industry is emblematic: with BIM (*Building Information Modeling*) systems, it transforms the project into a "living" model of the building, capable not only of representing it in a three-dimensional form, but also of providing it with all the structural information on materials and systems, so as to be able to simulate the impact of any change, both on statics, time and production costs.

The architect is therefore now equipped with his own building simulator, which does however require a new approach and specific training.

14.2.3.4. Production

"A manager's guide to augmented reality" also deals with the theme of simulators in the production sector in new highly automated factories. In factory production chains, augmented reality 3D models of machines are integrated with control and automation systems and various sensors showing information about the parts in production. Many machine tool manufacturers - such as *Iconics* - are integrating AR into their production machinery. The automatic factory tends to be represented with a three-dimensional model that allows the monitoring and management of each machine with a digital interface not unlike those of current video games.

The three-dimensional modeling that is present in many video games, is becoming a widespread activity in the world of work, both for the continuous expansion of CAD CAM systems in factories, and for the widespread use of 3D printers even in small businesses.

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14.2.3.5. Logistics

Returning to the Harvard document "*A manager's guide to augmented reality*", we discover the applications of Virtual and Augmented Reality in logistics. DHL is replacing the paper lists with AR eyewear designed specifically for finding products in warehouses.

14.2.3.6. Marketing and sales

"Although "challenges" may be made up of (such as the E-strat challenge conceived by L'Oréal) as well as integrated into the actual sphere of work activities (sales competition), real-life scenarios are a fictional tool by definition and belong to the category of simulation games, and more precisely to the class of role-playing games we have observed." (Savignac, 2016)

The marketing and sales sectors are also changing thanks to the *gamification* and *digital twins* of the products, first created for production but then made available to customers in the *World Wide Web* and Apps. The "digital twin" is very effective in configurable and customizable products, increasingly popular in *e-commerce* sites.

Configuring a product to your liking is a form of digital *gamification*, the experience of which is reminiscent of many video games. Sales managers must increasingly consider *gamification* as a component of *online marketing* but also in-store *marketing*. Here, too, the skills that are typical of video games are valuable. Even products to be contextualized, such as IKEA furniture or AZEK tiles, can use "*digital twins*", which thanks to AR are superimposed on real environments. In *e-commerce* holograms of products are used, such as in IKEA catalogs, with thousands of products in 3D contextualized in the homes of consumers. Michael E. Porter and James E. Heppelmann (2017) argue that Augmented Reality is revolutionizing the concept of *showroom*, product demonstration and *customer experience*. AR can radically change the experience of the product by giving more information and increasing loyalty. *Augmented Reality* can improve the consumers' perception of a product and reduce both the number and size of warehouses and *showrooms*.

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14.2.3.7. After-sales

The revolution then comes to after-sales. Augmented Reality is used for instruction and service manuals. Augmented Reality manuals are not only for customers but also for repair technicians. KPN uses Augmented Reality for repairs to telecommunications systems, XEROX uses AR instead of manuals and telephone support, increasing *customer satisfaction* by 95%.

More generally, it can be summarized that Augmented Reality will play an increasingly important role for human resources, thanks to the reduction of errors and the increase in productivity. DHL, US NAVY and BOEING use AR for *step-by-step* training, identifying efficiency and also the prevalence of certain errors.

Regardless of the presence of a product's *digital twin*, the concept of simulation - central to video games - is rapidly entering the world of work. Digital models that simulate reality are moving from video games to everyday use in many professions.

14.3. Virtual gesture skills

Then there is the question of the acquisition of new virtual gestures: in front of a *mouse* some people of a certain age may still be uncomfortable; but even people of undoubted scientific and technological background, such as the Italian scientific broadcaster Piero Angela, the first time they found themselves in front of a *mouse were* in great difficulty.

Anyone can find themselves in trouble in front of a digital *device*, such as a video game *joystick*. This is what happens to surgeons who use *robots* for surgical operations. These extraordinary machines, which use high-precision servomechanisms, require a tiresome *training* period. The best surgeons, who have acquired extraordinary sensitivity and skill in the hands, could be put out of action by these new tools. Tools that on the contrary could benefit less skilled surgeons but already accustomed to using virtual prostheses in video games.

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This new "virtual gesture" could change many professions, such as those of the sculptor and the goldsmith, who are quickly switching to digital modelling tools, those that need a gamer's sensibility.

The familiarity with these new arts, with these professional *avatars*, with these simulators of real contexts, has much to do with the world of video games.

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