



Giuseppe Galetta. Ph.D. Candidate in Psychology of Arts and Creativity at University of Cassino and Southern Lazio (UCLAM), Italy. Graduated in Literature and Philosophy at University of Naples “Federico II” (Italy), I am a Digital Humanities specialist passionate about Contemporary Art and New Technologies. My interests include: Creativity, Knowledge Management, Digital Epistemology, Cybersociology and Netnography. I’m currently working on my startup that will focus on an innovative Web 3.0 project about Contemporary Art.

GIUSEPPE GALETTA

Department of Humanities and Social Sciences
University of Cassino and Southern Lazio, Italy

THE GAMIFICATION: APPLICATIONS AND DEVELOPMENTS FOR CREATIVITY AND EDUCATION

Abstract

Introduction. *Gamification is the use of game mechanisms in non-gaming contexts in order to increase individual engagement and motivation: this allows to perform jobs or solve problems in enjoyable and rewarding way. **The aim of the study.** Demonstrate that “Game Thinking” changes the individual behavior in social learning and knowledge acquisition. **Materials and methods.** The investigation method is based on the context analysis, supported by data available online. **Results.** Gamification stimulates Creativity and improves Education, accelerating Innovation Processes. **Conclusions.** Game-based applications will be more and more used to motivate workers and students, improving learning and performances. **Key Words:** Gamification, Knowledge Management, Social Learning, Creativity, Education.*

INTRODUCTION

The use of *Game Thinking* is increasingly growing in all areas of social life. But what is the reason for this diffusion? Is this trend significant to identify a new model of knowledge? Can this model change the individual behaviour and develop Creativity?

As is well known to insiders, the term “*gamification*” was coined by Nick Pelling in 2002 and popularized by Jesse Schell, who during the DICE Summit 2010 in Las Vegas (the most important conference in video game industry) gave a talk entitled “*Design outside the Box*”, in which he anticipated the advent of a society where the Game, coming out of the computer box, will spread in all areas of social life influencing our behaviour and the knowledge systems, including Creativity.

Gamification is the process of diffusion of gaming practices in non-gaming contexts or the application of gaming metaphors to real life in order to influence behaviour, stimulate engagement and increase motivation in performing a task or achieving a goal. The Gamification develops since the 80’s, with the introduction of the icon-based operating systems and the *desktop metaphor*, through which the access to the new information technologies has become user friendly. Thanks to WYSIWYG logic (*What You See Is What You Get*) the user can interact with the computer environment in easy, engaging and intuitive way: game dimension invades the home space through new graphics interfaces able to simulate the real world, getting the people used to a new form of entertainment and inducing the video-ludic space introjection.

When some companies realized the game potential associated with everyday life, new tools were created to increase the advertising efficacy (*Advergaming*) and improve the education and learning through the virtual reality integration with real life (*ARG* or *Alternative Reality Games*). The progress of Human-Machine Interfaces, Virtual Reality, 3D, Computer Graphics and Animation allowed to transfer the Gamification and *Game Thinking* in more serious contexts, for example in the field of military training: a pilot can be instructed by a flight simulator to fly and fight in safe way, getting the necessary know-how for acting in reality. The simulator creates a protected environment, a parallel reality where the user (by his *avatar*) tests and improves the skills, transferring finally what has learned in the workplace.

Out of the specialized video game industry, the Gamification was first established as a business practice able to increase the product sales or retain customers, then its mechanics have been successfully applied to the knowledge and learning, both in education and in work activities, encouraging people interest, involvement and participation: this is the transition from video game to new edutainment products, which combine entertainment and educational value. Today, through the mobile devices, game applications have a wide use and social diffusion: *smartphones* and *tablets* make the social games accessible anywhere and anytime, while Facebook and its apps facilitate the processes of viralization and diffusion of *Game Thinking* among the users, changing the mode of learning and knowledge acquisition.

The pervasiveness of new technologies lets to track the user's choices through metrics and analytics systems, which describe the user behaviour and allow to change the route in case of error: using a smartphone we are projected into a gamified world, in which we are apparently playing, but we are actually influenced by it.

The Gamification is based on the contribution of several disciplines, including Virtual Reality, Cybernetics, AI and Behavioural Theories: the Gamification is based on engagement techniques based on game mechanics to influence the human behaviour and change the habits of people, groups or specific communities. Indeed, these techniques have been around for a long time, but the development of digital technology and the diffusion of mobile devices, that use game applications, have produced a real phenomenon that is fast propagating through the Internet and Social Networks. But some companies have already started to apply the potential of Gamification to everyday life, even outside of a technological environment (e.g. "*The Fun Theory*" by Volkswagen in Sweden).

The Gamification is a direct application of Game Theory and joining effectively the Social Learning Theory: Serious Games come out of the synergy between that two theories. The Game Theory has facilitated the Gamification development through the conflict studies and the research on competitive and cooperative solutions based on mathematical models: in fact, the aim of the theory is analyzing the individual decisions in interaction with other antagonists, where one's decisions can influence the another ones according to a feedback mechanism: the aim is to obtain the maximum gain. Many human actions in everyday life, although essential, are often boring, repetitive, alienating, or stressful: paying taxes, using public transport, keeping in shape, separating the waste, respecting the rules of the road and so on. The game instead is an activity rewarding in itself, because generates engagement and motivation, by stimulating important human needs such as: cooperation, competition and socialization. In fact, the principal aim of Gamification is engaging people and motivate them to perform the routine tasks by game practice.

Game mechanics are really effective because just based on human desires and needs: they provide targets to be reached and rewards to be gained by facilitating the expression of the Self in the communities, allowing the problem solving in a simple and engaging way, by stimulating Creativity and finding alternative solutions. As well as improving and making more pleasant the everyday life experiences, the games also give a more epic and memorable meaning to human actions: the user feels like the protagonist of a very important story, as a video game hero.

The efficacy of reward mechanisms in the execution of programmed actions had already been highlighted by I. P. Pavlov (1927), through his studies about the the animal conditioning: the stimulus/response model produces learning and adaptation to environment. Due to reward mechanism, the Gamification is very close to animal training techniques, in which game factor is essential in inducing the desired behaviour, but also to the children education, who learn better and faster through the game.

Both in human and animal worlds, game is a prerogative of young individuals, intent on environment exploration and learning the necessary rules to control it. The game reproduces behaviour patterns that, in case of attack or defense, are inhibited by inoffensive fiction schemes for stimulating an adaptive response. This is an instrumental conditioning, which is different from classical conditioning theory by Pavlov because in this case the game is an “instrument” for obtaining a reward.

Game mechanics are increasingly evolving by means of the game design studies, but the Gamification identifies no longer with video games, that now represent an *old medium*: it is a more complicated process including rigorous and almost ritual mechanics and dynamics. A game is the result of an accurate *game setting* engineering, in wich game aesthetics and graphic design have a fundamental role, because they make the user experience more realistic, immersive, pervasive and so engaging. In fact the Gamification is based on: a game environment (setting); a platform of clear and shared rules, that guide the user or manage the interaction mode; missions, challenges, goals and achievements; a reward mechanism, based on points, credits, badges, virtual goods, level-up, progression dynamics and other incentives for motivating the player to move forward in the game; measurement systems of user progress (progress bars, leaderboards, score boards, status indicators, counters); fixed time limits with deadlines and long-term objectives; community collaboration. This model also provides an instant feedback system: for every action a result is returned to the user, who can correct any errors or decide whether to change its behaviour for achieving progresses in the game and getting a final prize or reward.

The Gamification operates through experience systems based on an structured storytelling. The script of a game application include both game mechanics and dynamics: mechanics are the rules that make up the game settings and manage the interaction between player (input) and system (output); dynamics instead identify the behaviours adopted in game progression. The mind is so much pleasantly captured by the game setting, that it plunge into the “flow”, a state of consciousness in which the user is totally immersed in a task: this state causes a total involvement, focus on the goal, positivity and gratification in performing a task. The more the narrative plot is engaging, the more the user feels immersed in a rewarding context and is motivated to solve a problem: involvement and motivation are directly proportional. In this state of consciousness the contents are transferred easily and effectively to the subject. In a recent study about the influence of the game on society, Jane McGonigal (2011) declared that the game factor can facilitate and improve the understanding of the present world by facilitating knowledge transmission, social learning and encouraging people to positive social behaviours (best practices). McGonigal said: “*When we're playing games, we're not suffering*”, meaning that the Gamification is able to reduce the stress level in the execution of a task, allowing a better concentration, activating the attention mechanisms in problem solving by stimulating new ideas and creative or unconventional solutions: by playing we learn, work and feel better. So it's possible to face up to "distressing" situations through gameful representation of scenarios, that allow the people to test their behaviours and self-correct the errors, achieving the self-control and the domain of social environment, which stimulates a greater self-confidence and gratification, unlock the creative flows. According to the dynamic psychology, this is the "cathartic" aspect of the game.

AIMS OF THE STUDY

The aim of this study is to demonstrate that the use of Gamification and game mechanics and dynamics in non-gaming contexts is really able to change the user behaviour, inducing a concrete increase of engagement and motivation, stimulating Creativity and the ideas generation, improving learning processes and knowledge diffusion, producing active responses and measurable feedbacks. We wanted essentially to verify the actual effects of Gamification on Creativity, its influence on knowledge management and social learning, and its contribution to the social innovation processes, that is how much the Gamification is changing the knowledge and whether it is possible to measure this change.

MATERIALS AND METHODS

The method on which this research is based is the scenario analysis, that allowed to identify the social context in which today *Game Thinking* and game mechanics and dynamics are most widely diffused. Besides we have also carried out a data analysis about the metrics and analytics available on the most important gamified online platforms. In fact, the Gamification is generally implemented in a digital environment, because technology is the main driver in diffusing of the *Game Thinking* in real life. Therefore we have analyzed:

- Type of Game Applications.
- Game contexts.
- Game targets.
- Game devices and tools.
- User experience and interaction with game mechanics.
- User satisfaction and ratings.
- Social diffusion and virality in game-related contexts.
- Storytelling: script and narrative plot in game settings.
- Social and psychological influence of the Gamification on users.
- Metrics, analytics and folksonomies.

The materials of investigation on which is based this research are:

- some of the most popular social games on *Facebook*, also called *MMOG* (Massive Multiplayer Online Games, that is collaborative online games, as *Cityville* and *Farmville*);
- some of the most popular online social apps (as *Foursquare* and *Linkedin*);
- some serious games in the field of health and wellness (such as *Health Month*, that allows the user to compete against other people in adopting a healthy lifestyle, or *Lose It* for helping the weight loss);
- some apps in the field of civics (as *Recycle Bank*, app for trash separation and collection in the U.S.A., or *Speed Camera Lottery* in Sweden, used for rewarding the drivers who do not exceed the speed limit);
- some *GBL* (game-based learning) applications;
- some games applied to the business activities or workflows (as *Taskville*);
- some of the most popular serious games for new home gaming devices as *Wii Remote*, *Move* and *Kinect*.

RESULTS

Several institutions, companies and authorities use game mechanics and dynamics to create more appealing services and products for the people, to improve their workflows and reach their goals. The implementation of *Game Thinking* in non-gaming contexts is an effective method, which allows to engage users in their tasks or activities: through the *Virtual Worlds* and *Adverworlds* companies spread their corporate values and promote their brands. Through the game the user becomes an active information consumer, which plays to getting knowledge or solving problems: human actions generate an instant feedback which allow to map the user experience, correcting any errors in order to improve the game system.

The material analysis allows to confirm that the Gamification has been actually producing innovation and change in knowledge management, bringing an effective improvement of social learning processes and increasing Creativity. The game mechanics that underlie the analyzed applications have proved to be effective in activating positively the user interest, motivating the choices, stimulating creative insight in problem solving, increasing the decision making, predicting future scenarios, transferring the knowledge, developing the individual skills, getting know-how, building communities.

Some researchers have described the game as *learning project* (Papert, 1998, p. 88), or *experiential learning* (Kolb, 1984), but in any case the information gained through the game remains deeply imprinted into the mind and it is easily retrievable to be operated in real life: this demonstrates that the Gamification brings about a change in user behaviour. In fact, Gamification has proved to be able in reducing the problem of creative block, activating positively the ideas generation process and unlocking the creative flow: game mechanics allow to connect present actions to future implications stimulating mental reconstruction of alternative, explorative and adventurous scenarios, that involve a multiplicity of cognitive aspects, opening the mind to unconventional solutions to problems, motivating to produce original and innovative ideas, transmitting the knowledge in a easy, engaging and effective way. The planned use of game techniques, both in cooperative (collaborative) and non-cooperative (competitive) mode, increases the mental restructuring of data according to alternative carriers, activating the combinative, commutative and transformative mechanisms of *lateral thinking* (de Bono, 1967).

The reward has an important role into the game setting. Its effects on Creativity development and ideas generation has already been widely tested: in brainstorming session participants improve the creative output if members are rewarded not only for their own contributions, but also for what those contributions are able to inspire other participants, in the same way a publication is considered more or less influential in academic world according to the number of citations received in the following researches (Toubia, 2006).

In game applications the user motivation in adopting a behaviour can be activated not only by a reward, but also creating an artificial lack of resources in the game setting, generating a sense of deprivation and needing, so the user is required to take the field as not to lose the chances to win (*loss avoidance*). Also the punishment and loss of the level or status reached by the user are based on the same mechanism: the fear in losing something is more powerful than gaining something new.

The effectiveness of a game application is based on a structured storytelling: the game script should have an engaging narrative plot to capture the user attention. From the problem identification to its contextualization in the game environment, through the specific definition of the target to be reached and the protagonists of the story. Also it is necessary to define precisely the goals, to identify the potential antagonists, to determine the game duration and study all the connections with the real life. In fact, the simple action of performing specific tasks to get points or badges can be interesting at the beginning, but in the

long time many users might feel not much involved, bringing about a high disposition to the saturation of experience and generating the impulse to quit the game: the attraction of an assured remuneration is being reduced over time, making the games less attractive and effective. But it seems that the behaviour induced by the game is acquired by the user as an automatism, like a conditioned reflex, because it allows the effective adaptation to the environment and the survival: a rewarding behaviour persists in the memory. Some research has shown that from a point of view of the brain functionality, game activities stimulate the striatum, a subcortical section connected to the reward mechanism. For this brain area, a sum of money is worth as a non-monetary gratification, such as the social appreciation or the achievement of a higher status: brain stimulation is the same.

In order to involve the user in the game setting it is needed to create a place - physical or virtual - that separates the player from the rest of the world. A sort of “magic circle”, a sacred space in which the user can get away from the surrounding world and focus on a specific goal, that is a boundary line that divides the game from the real world (Huizinga, 1939). The aim of this space is to emphasize the steps of transition to a new condition (exclusion *vs* inclusion or deprivation *vs* acquisition), in which the game is strategically used to modify the human behaviour in the programmed way. Therefore the Gamification is an effective tool to promote positive and cost-effective behaviours (best practices), but also it represents an important change of perspective: human beings have moved from performing actions suggested by the survival need to behaviours suggested by the pleasure of making them. As Bernard Suits says, “*playing a game is a voluntary attempt to overcome unnecessary obstacles*” (Suits, 2005): this means that the game practice has a recreational aim in itself and therefore is inherently rewarded (or *autothelic*): playing is already a gratification for the user. The Gamification becomes an essential device for human adaptation to the society, a basic practice in culture and social organization, no less significant than religion, politics and the legal system.

Competition is an important aspect of Gamification: that is the basis of many applications, especially for business, whose goals are: increasing productivity, improving performances, getting and preserving competitive advantages, stimulating the innovation. The competition has always been a fundamental element of the game: human beings compete to achieving their goals and establishing their own leadership. In fact, the reciprocal comparison of results and the emulation motivate to continuous improving. This behaviour is common in nature, where the survival of the species is based on the ability in teaching others the same winning behaviour, by activating mechanisms of evolution and transmission of successful techniques to other group members (Lorenz, 1990): today information management is crucial for our evolution and survival in social and working environment. Competition is based on the need to successfully and the taste for challenge, stimulated by the possibility of getting a prize. As confirmed by the analysis, there are two types of competition: positive (*adaptive*) or negative (*maladaptive*). The main characteristic of the positive competition is the user perseverance into “get involved” by respecting the rules, working hard in order to improve the skills. On the contrary, the negative competition is typical of a player who requires to not lose at any cost, obsessed with the idea to do better than any other, always in competition and also willing to cheat, by subverting the rules of the game. But also demographic factors may affect competition, such as gender (e.g. men are inclined to get involved even if they have limited possibilities, women if they have great chances to win) or type of culture (e.g. in the East the group harmony is more important than individual development). Therefore the game must be adapted to the type of user, but also to the reference cultural group in order to be effective.

Also the failure is a part of the game because it helps the user to improve, through the understanding of mistakes. Again, through the feedback, user can self-correct a wrong action: an aspiring pilot who fails a landing on the flight simulator, by correcting the errors, is

able to improve his performance and learn the correct procedure to be applied in the real world: the game progress is achieved by trial and error. Repetition generates the competence: so the user is able to structure the knowledge by oneself.

Another key component of game applications is the community, through which the users can meet, talk, share and compare the experiences, both inside and outside of their group: a game community is based on the virtual interaction among its members, that promotes the information exchange, creativity development, social learning, innovation and viral diffusion of knowledge by sharing and the relationships. The social dimension of Gamification is based on the communities that grow up around the game apps, in which main engagement factor is the process that allows the creation, consumption and exchange of information between users. The analysis showed that the Gamification increases and improves the social cohesion, just because the game strengthens relationships and mutual trust.

Thanks to the role of social relations, the *Game Thinking* is able to promote learning processes within the knowledge networks, facilitating the information exchange and stimulating the flow of information, both formal and informal, into the organizations, such as companies or institutions: that stimulates Creativity development and social innovation. Today to know means being connected: the knowledge stream is no longer vertical or linear, but linked and networked, in which the centre is everywhere (Siemens, 2005). Through Gamification and its mechanics and dynamics it is possible to generate a widespread, collaborative, shared and social Creativity, using the “crowdsourcing” logic and “peer to peer” services, so everyone contributes in building and distribution of knowledge: *blogs* and *wikis* are examples of e-learning organizations, that is informal networks of sharing and transmission of knowledge based on the Social Networks. In such an environment who finds a creative solution is socially accepted and acclaimed, Creativity is rewarded and encouraged, the winning behaviour is proposed as an example and it is rewarded, voted, reviewed, approved by the whole community and distributed by viral dynamics. *Wikipedia* is the most clear example of *open system* and *shared knowledge*, because it produces a new model of participatory and collaborative knowledge in which the same community contributes to its building and diffusion (Lave and Wenger, 1991).

The game behaviour generates measurable results: every user action can be monitored and tracked obtaining quantitative data in real time through metrics and analytics (instant feedback). But the possibility to create “*data-driven*” actions based on feedbacks could bring about a higher control and centralization of the knowledge, which must be administrated with extreme caution by who manages those processes, as companies or institutions. In fact, the Gamification could be considered as a manipulative practice, but this supposition is based on the fact that, in some susceptible people, the *Game Thinking* is able to induce new addictions: the immersive experience in a virtual world can give rise to alienation phenomena in which the Self conscious acts under the influence of drives and subliminal conditionings, that are able to induce unconscious actions. The user would feel “forced” to play the game in the attempt to reduce the gap between the real and virtual world, trying to resolve the conflicting perceptions and deal with stress determined by the cognitive dissonance between reality and the game world, looking for a state of emotional equilibrium, calm, satisfaction and fulfilment. In game design this is called “*behavioural momentum*”, which is the user inclination to continue in doing what he is doing: e-games of chance are just based on that. But the pleasure induced by the game activities has also a biochemical basis, because that stimulates the production of dopamine and oxytocin, which – as is well known – are active in producing a sensation of well-being and control over the environment. User is conditioned to repeat the game experience in the attempt to feel the same pleasant sensation: in some susceptible people this would determine a compulsion to repeat, or an obsessive-compulsive disorder that is itself pathological. This is what happens to compulsive players or

game-addicted: the reiterated mechanism of gratification can be addictive or even to push toward aggressive behaviours due to the competition dynamics related to the game.

There are several reasons why the game mechanics are so engaging. First, they touch basic human desires, as competition, altruism, self-realization, search for a higher status within a social group: the Gamification improves the attractiveness for a task or the desirability for a behaviour, allowing to orientate behaviours and to develop socially recognizable skills. Secondly, the Gamification establishes targets to be reached, rewards to be won and levels progression, encouraging the competition and sharing the success with other users. And besides, game applications give the sensation not being criticized or judged; activate a better memory by increasing levels of learning; stimulate creativity in problem solving accelerating the innovation processes; build a *customized knowledge*. In fact, the need for knowledge is connected to the need to dominate reality: increasing our skills is equivalent to increase the survival chances in a hostile environment. The Gamification is effective just because it moves around the meaning of “progress”, but also because it is possible to measure this progress. In addition, the games allow us to leave reality to identify ourselves with other people, other worlds, other rules, other roles, other aims, often impossible in real life. Finally, we love games because we do not risk anything: people are generally opposed to the risk and hate the idea of losing; in game settings instead, unlike the reality, every choice is easy because, even in case of defeat or failure to reach a target, there is no punishment nor irrecoverable loss: the game space is a safe and secure environment, where the subject in action is an *avatar*, that is our “double” in the virtual reality.

CONCLUSIONS

The Gamification is revolutionizing the traditional knowledge system in all areas of social life and it is emerging as a new model of knowledge acquisition in contemporary society, able to displace gradually the classic learning systems and transmission of knowledge: Gamification is therefore an evolutionary milestone in the field of human knowledge. In fact, the diffusion of digital technology makes the use of Gamification most pertaining to the new generation of *digital natives* accustomed to the video game practice: today users have become so accustomed to these practices that they look for stimuli related to game patterns into the surrounding reality, selecting those ones compatible with these patterns and rejecting the others, because less attractive.

Technology is the key driver for the diffusion of game mechanics on a social scale: the penetration of *Game Thinking* in social life will increase with the growth in the using of mobile devices such as *smartphones* or *tablets*, which represent a gamified environment for the user and an applications kit for every need: knowledge systems and learning processes will therefore be increasingly gamified. Today the Gamification is utilized in many fields of social life: business, institutions, education and training, health and wellness, prevention, no profit, communication, marketing, advertising, art, entertainment, finance and economy, e-commerce, e-learning, military strategy, sport, politics, science, law, medicine, sustainability, surveys and market research, web and social networking. Serious game and game mechanics are increasingly being used to motivate the workers in performing tasks and the students in learning processes, making routine works more interesting, rewarding and less alienating, driving the user behaviour in a pleasant way during his daily activities.

Future scenarios suggest a diffusion of a *playcentric* approach to life and a wider use of the Gamification in the fields of Knowledge Management and Social Learning, and this trend will accelerate the social innovation processes. In fact, the virality (typical mechanism of content diffusion on the Net) generates imitative behaviours and helps to spread more and more the *Game Thinking* and game dynamics in our society.

At this point we want to introduce a new epistemological concept: the *Gamified Knowledge*. This definition is intended to indicate a new model of acquisition, sharing and transmission of knowledge based on the *Game Thinking* and game mechanics, but also a new system of personalized knowledge, that people can build and organize according to their specific interests by using the options provided within a programmed learning kit: from “*learning by doing*” to “*learning by playing*”.

Gamified Knowledge has its own specific characteristics. In fact, this new model of knowledge is:

- Networked: it is diffused and interconnected by the web.
- Shared: it is based on the collaboration of the user community.
- Responsive: it is based on feedback and able to self-correcting.
- Customized: it is modelled about the user needs.
- Measurable: it is able to give back results and statistics.
- Self-growing: it is able to grow by itself thanks to the user contribution.

In the near future the more important developments of Gamification will concern particularly the domain of knowledge analysis: in fact, people produce enormous data flows and everything about our private life can now be tracked and stored. The Gamification makes possible to analyze, store and use that information to correct errors, reset the objectives and improve the whole system of knowledge management according to specific user needs and that will help to develop predictive models for the future, excepting possible risks of ideological control or manipulation. In fact, not always the Gamification is consciously consumed. Sometimes we do not notice when we are utilizing gamified applications and often we are working or studying without consider to being involved in a game: we are playing an *unaware game* (Montola and Waern, 2006).

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Giuseppe Galetta

Ph.D. Candidate in Psychology of Arts and Creativity
 Department of Humanities and Social Sciences, University of Cassino and Southern Lazio (Italy)
 Address: via Mazzaroppi, 6 – 03043 Cassino (FR) – Italy
 Phone: +39 0776.2993453. Fax: +39 0776.2993434
 e-mail: giuseppe.galetta@unicas.it