

Using creativity techniques to create new computer games

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ABSTRACT

In the face of growing global game production competition, the ability to come out with new ideas to create computer games is widely recognized today as important. In this context, the chance to resort - in a practical way - to known creativity techniques or adaptations of these to help innovation in this field is a promising challenge, both in the field of entertainment games and the so called serious games. In this article we present the development of a research work in this area and the result proposal method for the introduction of creativity in Games Design. The main objective is the construction of innovative Games that have not been identified by the normal methods used in the analysis of games proposals. We present a case study of the method implemented for the identification of new games design opportunities in an MSc Games course.

Author Keywords

Games Design; Creative Thought; Innovation

ACM Classification Keywords

K.8.0 Games

INTRODUCTION

Game Design is a process where concepts and ideas are created and where it is defined the mechanics of the game, the dynamics and the emotional responses of players. The mechanics game components are its rules, which are data representations and algorithms. Dynamics is the run-time behavior, i.e., the way the player interacts with game elements and the outputs of that interaction. Aesthetics represents all the players' emotional responses and bonds with the game (Hunicke, 2004).

Game design demands for creativity and imagination to not only get players attention but mainly to hold it, which

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requires exploring every aspects of a game centered in players' motivation and engagement. In fact, being creative in game design is a hard task because a game should blend beauty, a story and a gameplay hold players' attention but this task encompasses many disciplines, as for example, psychology and history or computer science, etc., which is especially difficult if the company is small or it's a personal project (Isbister, 2010; Lemarchand, 2014)

The ability of games companies to efficiently use information technologies better with respect to innovation and creativity is recognized as an important factor for the competitive edge and agility of those companies. Organizations naturally take benefit, through creativity and innovation, to reorganize their processes and products in a more effective way (Cooper 2000). In this context, the chance of resorting to known creativity techniques or adaptations of these to assist with the generation of ideas for games, which help to produce new combinations that result in unexpected and original games is challenging.

In this article, taking a narrower view, we propose a process for the introduction of creativity and innovation techniques in Games Design, which aims at the construction of original and interesting games and, thus, which provide a better competitive edge for businesses.

CREATIVITY

In the last 60 years research activity about creativity has been vast. Creativity and creative processes are a case study in many areas; namely, psychology, cognitive sciences, neuro-biology, education, philosophy, theology, technologies, sociology, linguistics, management, innovation, sciences, economy, among others (Tarrida, 2008).

Psychology and cognitive sciences have focused their attention on the study of mental representations and the underlying creative thought. For Candeias the main focus until the 1970s was on approaches related to creativity based on personality studies in order to identify the creativity features in different domains. From then on the main focus of research changed to the components of creative thought and the resolution of problems (Candeias, 2008).

Creativity study in neuro-biology has had - in the last few years - a reasonable success with, for example, the appearance of works that try to link individual creativity to

communication between areas of the brain that are not normally linked together (Heilman, 2003).

Also in epistemology and theology there are research activities that approach creativity. Philosophy tries to answer questions such as “What is creativity? How does it come to be? How does creativity manifest itself in findings, inventions, science and art? What is the role that creativity has in the construction of “me”? Theologians debate the connection between creativity and holy and divine inspiration, e.g. “Human beings will have the ability to create something new that is none other than an expression of God’s work?”

In the fields of sociology and education from the current understanding of the relevance of creativity in social and educational contexts it is possible to verify intense and rich investigative activities.

Recently, several investigators have turned their attention to the introduction of strategies in the classroom that allow for the stimulation and development of creativity in school students, of creative teaching as a way to promote communication between teacher and student and of creativity as a way of stimulating self-learning (Moraes, 2008).

In the fields of management, innovation, entrepreneurship, economics and technologies the importance of creativity, as a first step for the birth of inventions and innovative support, has had a strong and diversified focus in virtually all areas including - in particular - the field of information systems and technology, where this work is located.

The conception and study of computer games is complex in itself. Its complexity has its origin in the fact that computer games combine human and technological resources and - in a transversal way - they involve and challenge a lot of different human psychology aspects like physical skills, intelligence, ludic, and most of the cases they also require the use of many distinct technologies.

Games’ design, as a creative activity, adds to the difficulty of trying to reach the player’s aims and also the market opportunities that may occur in the future. The introduction of creative processes and techniques in different Games’ design approaches, could stimulate the production of ideas, resulting in new combinations that in turn obtain original and useful ideas for games. The consequence is the generation of innovation in Computers Games and in the way that they are used.

The search for a solution to this problem determined the main motivation and purpose of this research work focused on creativity in games’ design. The main hypothesis is the possibility of conceiving an actual strategy for the introduction of systematic creative processes able to produce original Computer Games.

Creativity Techniques

Some authors classify the more than two hundred existing techniques into problem definition techniques in order to explore the attributes of one particular problem, to generate alternatives or for the visual exploration of metaphors, analogies, assessment and implementation of ideas (Cave, 2013; Mycoted, 2013).

This big diversity of creativity techniques is promising for our goals, since games’ design has a vast context, since it covers the whole organization and its involvements, as well as the most varied branches of activities and technologies. This virtually means multiple tools and the possibility of choosing the most adequate for each specific situation.

Among the several creativity techniques of the “Randomizers” category and “Focalization Techniques” according to the classification of Zusman (1998), six techniques were selected, namely: Brain storming (Osborn, 1963), Brute thinking (Michalko, 2006), Whiteboard (from “Randomizers”), IdeaBox (Zwicky, 1969), Reversal and SCAMPER (from “Focalization Techniques”).

The criteria for the selection was based on three factors: a) the ease of use of each technique, b) its creative power and c) the predicted adaption to the different types of game design problems, markets and people, which we want to target in the game design process. However, it is important to mention that several other techniques could have been used in this category instead or as a complement to the ones selected, without a significant loss for the research results presented in this article.

As a result of this experiment, throughout the two years of practical application of these techniques in several workshops, as well as in the case of application and validation, general recommendation were produced for application purposes in the context of game design creative problems.

Figure 1 presents general recommendations for the applicability of the selected techniques, as an outcome of this two year fieldwork experiment of the techniques used depending on the problem in focus. In some cases, there existed an overlapping, which meant that it was possible to apply any of the indicated techniques and end up with a strong probability of success or in an ideal situation to apply all the techniques and obtain the widest number of possible solutions.

In this stage it is important to keep an open mind, so that it remains possible to obtain the greatest number of alternative solutions before selecting the best. In the face of a possible high number of possible alternative solutions, one must consider a formal evaluation method in order to choose the better solution.

Applying Creativity Techniques in game design process

In order to apply those creativity techniques to create computer games and with the goal of identifying new ideas

for games some workshops were organized in the context of the course “Digital Game Technology” from the Electrical and Computer Engineering MSc of the New University of Lisbon, both in the 2013/14 and 2012/13 editions.

		Type of challenge			
		New game	Improvement	Integration	New type
Creativity Techniques	Brainstorming	X		X	X
	Brute Thinking				X
	Idea Box		X	X	
	Reversal	X	X		
	SCAMPER		X	X	
	Whiteboard				X

Figure 1. Applying creativity techniques according to the type of challenge

The workshops were essentially practical and each had a total duration of four hours and involves 20 students. A generic method for the Introduction of Creativity in Games’ Design was tested and validated in the creation of new games project.

The execution of final validation tests resorts on the acquired knowledge of these workshops and the application of methodological development work.

As envisioned in the method designed prior to the experiments, the workshops were divided into four parts, namely: a) Identifying the teams, b) Focus on the problem, c) Finding the Solution and d) Plan an Implementation. In each workshop the method has been corrected and adjusted in order to achieve better versions, in fact, the application of this method was itself a case study which also leads to new learning and adjustments of the method itself. It had as main goal the identification of innovative games that might help the MSc Students to define their final projects. As a secondary goal, there was the validation and improvement of the methodology by trying to tune the convergence of the creative processes in the Games’ design.

The application of the techniques in two different editions of this course resulted in the creation of 16 games. Table 1 highlights 4 of these games:

Apart from these workshops, helping through the practical experience acquired on the ground, and the elaboration of methodological design and its progressive adjustment and refinement, they also helped to outline the validation process and the applicability analysis.

Jail's Escape	The player has to run through a forest and try to be the first to reach the end.
Little Red Riding Hood – The Game	A set of playful exercises for children
Hero Zombie	The player embodies a zombie that has to find the way out of a labyrinth
Kinect Sign	A game connected to the Kinect sensor that aims teaching the sign language to listeners (Rybarczyk, 2014)

Table 1. Top MSc Student games

As an example of the method application, the description of one workshop using the creativity techniques follows. The application of the method was carried out according to the following process:

1 - The teams were constructed by the course professors, before the workshop took place. A careful selection was made towards resulting heterogeneous groups, built up by elements with distinct profiles, allowing “out of the box” thinking.

2- The following challenge was presented to the students: “Create an innovative game able to fill the market needs and to obtain a new public”. In order to achieve this goal the primary creative working questions were:

- Find a new idea - What we want to build?
- Have an original narrative - Which history?
- Deal with innovative rules - Who is the player and who the characters roles in the game context?
- Play in a different way– Which interaction and perspective?
- Plan a different gameplay - How will we have FUN, FUN, FUN?

The market needs and themes were also consider in the attempt to reach these goal. These primary creative working questions were tackled jointly by filling in a support document and deciding what the ideal solution would be (objective).

3. After this step, a discussion took place within each team and it was created a causal relationships diagram in order to identify and list the primary sources of the challenges.

An example case of a game causal relationships diagram is presented in Figure 2. The primary creative working question was “how to use a game to teach Portuguese Sign Language?”

Game Name	Short Description
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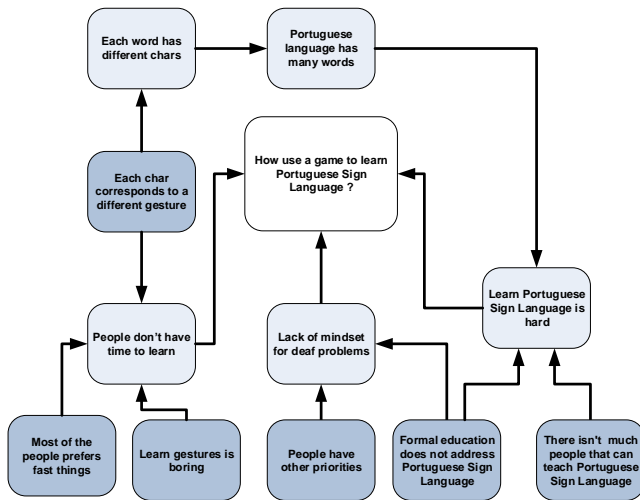


Figure 2. Causal relationships diagram

4. Based on the different challenges (example: the objective shown in the center of the Diagram of Relationships) the following task was the identification and listing of the key points that would sustain a different proposal for each challenge.

The resulting primary (root) causes for this case are:

- Each char corresponds to a different gesture
- Most of the people prefers fast things
- Learn gestures is boring
- People have other priorities
- Formal education does not address Portuguese Sign Language
- Not too much people that can teach Portuguese Sign Language do exist

5. In order to approach the problem in relation to the types of primary causes identified, two different strategies were chosen (representative of the different categories) Both techniques were applied by all the participants groups. The first strategy was to apply a randomizer creativity technique to get innovative ways to look to the root causes. The chosen randomizer technique was Brute thinking.

Brute thinking by Michael Michalko (2006) is a technique that aids lateral thinking, as well as creativity. It can be used to conceive alternative solutions but may also be useful for identifying the causes of problems. This technique is based on a very simple process that is developed in four steps: 1 - choosing a random word, 2 - choosing associated elements for that word, 3 -forcing links between the word and the problem on one hand side and the associations and the problem, on the other hand side, and finally 4 - listing and analyzing the resulting ideas.

In the example case the Brute thinking technique was applied one time. The word randomly obtained was: “elastic” and the selected things/elements associated to the word “elastic” were: “flexible”, “ rubber”, “extensible”, “variable size”, “moldable”, “ useful”, and “soft”.

As prescribed by the Brute Thinking technique the next step was to try to force links between these things/elements and the problem’s primary’ causes and to write phrases with new perspectives. The most promising associations were: “Make each char correspond to flexible gestures”, “Have a system that allows gestures with variable size” and “Build a system where the user could learn Portuguese Sign Language in small but extensible steps”. These ideas were interesting but not extraordinary as expected.

Process/product reviewed			
Transformation		Typical Questions	Solutions
S	Substitute	What can I substitute to make an improvement? What happens if I swap X for Y? How can I substitute the place, time, materials or people?	
	Combine	What materials, features, processes, people, products or components can I combine within the problem area? Where can I build synergy with other products/processes?	
A	Adapt	What other products/processes are similar to the one at root cause of our problem? What if we adapted them? What could we change to make them fit our purpose?	
M	Modify/ Magnify/ Minify	What ways can we completely change the product/process? Can it be improved by making it stronger, larger, higher, longer, exaggerated or more frequent? Can it be improved by making it smaller, lighter, shorter, less prominent or less frequent?	
P	Put to other Uses	What other products/processes could do what we need to do? What other things are going on that we could make use of?	
E	Eliminate	What would happen if we remove a component of the product/process? What would happen if we remove the whole thing? How could we achieve the same objective if we weren't able to do it this way?	
R	Rearrange/ Reverse	What if we reversed the process? What if we did step B before step A? What if we moved step A & did it last of put step Z first? What if we did these two steps together?	

Figure 3- SCAMPER

The second strategy was to apply an attributive creativity technique to create a new game from radical changes in the characteristics of an existing game on the market. The selected attributive technique was SCAMPER.

SCAMPER is a technique for looking at possible transformations that one could apply to a product or process. Looking at these transformations can help one

identify “out-of-the-box” approaches by looking at the problem from different perspectives. It is particularly useful where conventional approaches to the problem may already have been tried unsuccessfully. The SCAMPER transformation triggers are presented in Figure 3. It shows a template that supports the application of the SCAMPER technique.

In the example case the SCAMPER technique was also applied. The selected start product (an existing game) was Lingo. Lingo is an American television game show. The main rules are: two teams of two players compete. One team's Lingo card had even numbers and blue markers, and the other had odd numbers and red markers. Seven of the twenty-five spaces on each card were covered to start the game. Play began with the red team and a five letter word was randomly for them to guess with the first letter displayed. The objective was to both correctly guess and spell the word, and both players took turns until they either did so or lost control. Guessing any mystery word on the first try won the team. A team could lose control if any of the following things happened: Failing to guess the word correctly within five tries; Giving an invalid word, whether it be misspelled, not in the dictionary, or not five letters in length; Failing to come up with a guess within five seconds.

If there was more than one unrevealed letter in the word, one would be given to the other team before they took control. If the last letter in the word was unrevealed, the team would not get to see it but were allowed five seconds to confer (Wikipedia, 2014).

After applying the “Substitute“, “Adapt“, “Modify” and “Put to other uses” transformations it became possible to create two new games that could help to learn Portuguese Sign Language:

- the creation of the Quiz game, where the user is presented with a question, for instance “What is the symbol for the letter ‘B’?” and he or she must answer reproducing the correct letter from the presented 4 gestures possibilities.

the creation of a game where the user must find the correct five letter word in five different tries, for example. So, for each try the user must spell one word in sign language and then the game verifies if the word is correct or not, what letters are in the right and wrong positions, and so on.

Conclusions

The obtained result was a proposal for a serious game design where the user learns the letter-signs and provides the user an environment used towards testing the learned skills (Rybarczyk et al, 2014).

This research resulted in a strategy that is consistent relative to the introduction of creativity processes and innovation in games design, as well as the operationalization of its application through simple and practical methods.

The next stages to be introduced in the ongoing work are mainly related to the development of new theoretical methods. These methods might support the design and development of games design strategies, including improvement of methodology. The refinement of validation criteria and the analysis of applicability and by performing new tests and evaluations, as well as the implementation of eventual corrections is also a foreseen improvement.

REFERENCES

1. Candeias, A.A. "Criatividade: Perspectiva integrativa sobre o conceito e a sua avaliação " in: *Criatividade: Conceito, Necessidades e Intervenção*, M.d.F.M.e.S. Bahia (ed.), Psiquilibrios Braga, 2008.
2. Cooper, R.B. Information technology development creativity: A case study of attempted radical change. *MIS Quarterly* 24(2), 245–275, 2000.
3. Heilman, K.M., Nadeau, S.E., and Beversdorf, D.Q. "Creative Innovation: Possible Brain Mechanisms " *Neurocase* (9:5) 2003, pp 369-379.
4. Hunicke, R., LeBlanc, M., & Zubek, R. MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI*. San Jose, CA: AAAI Press. Retrieved from <http://www.aaai.org/Papers/Workshops/2004/WS-04-04/WS04-04-001.pdf>, 2004
5. Isbister, K., Flanagan, M., & Hash, C. Designing games for learning: insights from conversations with designers. In *Proceedings of the 28th international conference on Human factors in computing systems* (pp. 2041-2044). ACM. , 2010, April
6. Lemarchand, Richard [Game Design Masterclass: Life of Play, Life of the Mind: What Game Design Can Teach Us](#) Glasgow Caledonian University, hosted by IGDA Scotland, 2014
7. Michalko, Thinkertoys: A Handbook of Creative-Thinking Techniques (2nd Edition), Ten Speed Press, Toronto, 2006
8. Moraes, M.d.F., and Bahia, S. “Criatividade” Psiquilibrios, Braga, 2008.
9. Mycoted "Creativity, Innovation, Tools, Techniques, Books, Discussions, Puzzles, Brain Teasers, Training," 2013.
10. Osborn, A.F. *Applied Imagination: Principles and Procedures of Creative Problem-Solving* (3rd ed.) Creative Education Foundation, 1963.
11. Rybarczyk, Y., Cardoso, T., Rosas, J., Camarinha-Matos, L.M. "Kinect-Sign: Teaching Sign Language to 'Listeners' through a Game", João Gameiro, Tiago Cardoso, Yves Rybarczyk. In "Innovative and Creative Developments in Multimodal Interaction Systems", Springer Berlin Heidelberg, 2014; eds:

12. Santos, V., Amaral, L., and Mamede, H. "A methodology for creativity introduction in the Information Systems Planning," in: 8th International Conference on Information Systems and Technology Management - CONTECSI, São Paulo 2011a.
13. Tarrida, A.C., and Femenia, D.C. "Dirigir la creatividad: Una aproximación al funcionamiento intelectual de los directores de cine," in: Criatividade: Conceito, Necessidades e Intervenção, M.d.F. Morais and S. Bahia (eds.), Psiquilibrios Braga, 2008.
14. Wikipedia - Lingo (U.S. game show) "[http://en.wikipedia.org/wiki/Lingo_\(U.S._game_show\)](http://en.wikipedia.org/wiki/Lingo_(U.S._game_show))," 2014.
15. Zusman, A. "Overview of Creative Methods," Ideation International Inc., Southfield, Michigan, USA, 1998.
16. Zwicky, F. Discovery, Invention, Research - Through the Morphological Approach Macmillian Company, Toronto, 1969.