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Gamification in project management: experiences from business and training

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More and more concepts of gamification or ludification are applied in the most diverse areas from health, education, the business world, etc. In the same way, gamification strategies can be applied for Project Management. This document reflects the experience of applying different concepts of gamification in practice such as the application of lego serious play in the different stages of project management: initiation, planning, execution and closing of a project in an engineering company. It also shows experiences of application of board games in courses of Project Management.

Keywords: gamification; ludification; serious play; project management; training; games

Gamificación en Gestión de Proyectos: Experiencias en casos de empresa y formación

Cada vez se aplican más conceptos de gamificación o ludificación en los más diversos ámbitos desde la salud, la enseñanza, el mundo empresarial, etc. En la misma forma, se pueden aplicar estrategias de gamificación para la Gestión de Proyectos. Este documento refleja la experiencia de aplicar distintos conceptos de gamificación en la práctica como la aplicación de lego serious play en las distintas etapas de la gestión de un proyecto: iniciación, planificación, ejecución y cierre de un proyecto en una empresa de ingeniería. Igualmente se muestra experiencias de aplicación de juegos de tablero en cursos de Gestión de Proyectos.

Palabras clave: *gamificación; ludificación; serious play; project management; formación; juegos*

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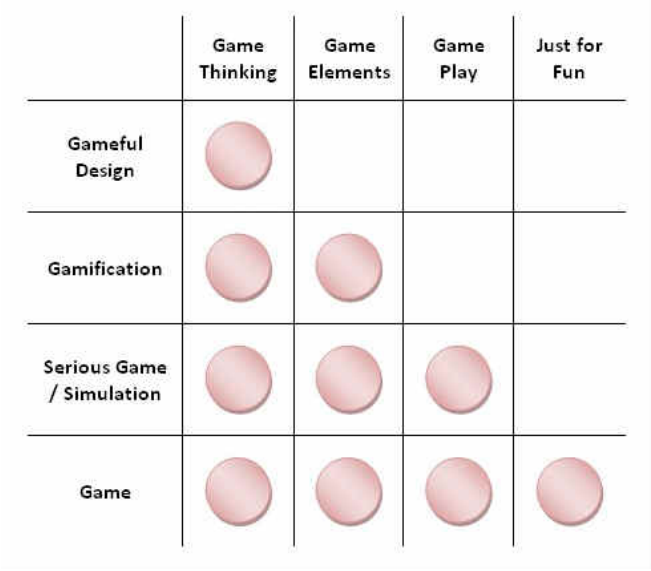
1. Introduction

Some authors locate the documented appearance of the idea of “gamification” applications between 2008 and 2010 (Paharia 2010; Deterding et al. 2011). The use of gamification tools and methods has the potential to benefit project managers from all industries because of their fundamental potential to shape and influence behavior (Association for Project Management 2014). More and more organizations are adopting these techniques to motivate and encourage employees and customers.

This definition contrasts “gamification” against other related concepts bearing in mind two linked dimensions, such as playing and gaming and parts and whole (Deterding et al. 2011). It is interesting to consider different terms depending on the focus of the game and its level or sort. The Figure 1 shows this differences in terms.

Figure 1: Differences in terms (Marczewski 2012)**.**



Educational games (or serious games) are specifically designed to teach people about a certain subject, expand concepts, reinforce development, or assist them in drilling or learning a skill or seeking a change of attitude as they play (J.V. Dempsey, B. Lucassen 1996).

All games explained later are been applied by the author either for teaching or for business applications.

2. Games and Serious Game for Teaching Project Management

2.1. Easy Games

Several easy games show how to “build” projects. This one is based on the construction of a “spaghetti tower” with spaghetti and marshmallows. In our case, its application has been in different project management courses in grade studies, even in “*in-company*” ones.

The objective of the game is quite simple. This is to construct a tower as high as possible using limited amount of spaghetti and marshmallows in small teams. Although it could be interested to restrict the time (approximately 20 - 30 minutes), in my case the teams had no time restrictions.

The rules are also simple:

1. All students are divided into homogeneous groups in size, usually between 3 and 5 people.
2. The instructor distributes the same material to each team.
3. The highest tower at the end of the game wins.

The application in a project management context is broad. The teams can apply concepts for planning, resource management, leadership and team working, communication, risk management, etc.

When the game is finished, the instructor with the students can make conclusions about the project planning and execution, and the related project management items.

After several sessions of this game in our courses, the conclusions are:

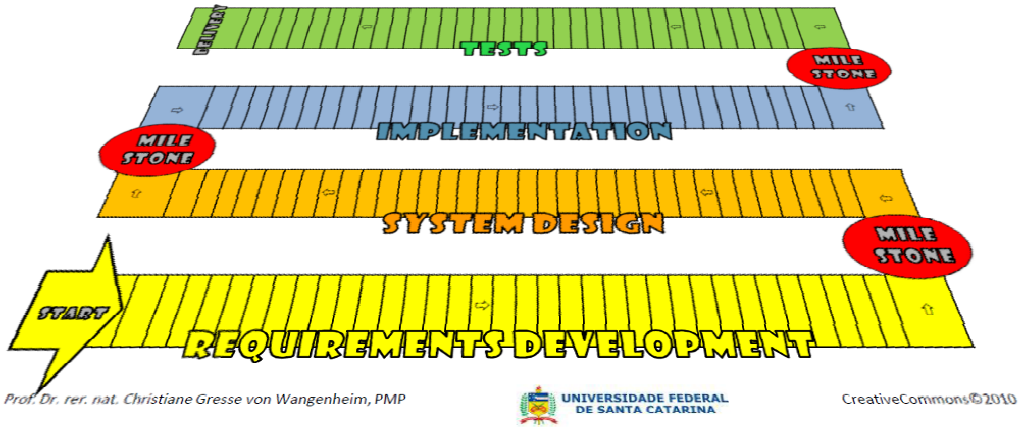
- "Advanced" teams find tips to get a higher dimension, for example, building "prefab" blocks, support the tower on a corner or break the spaghetti.
- On rare occasions teams plan or design in the game.
- This game is a good option in an early class, to introduce project management concepts.
- The class environment relaxes and it allows the teacher to teach complex ideas.

2.2. Earned Value Games

The Earned Value Analysis is usually a methodology that students have difficulties to understand as a control tool for projects. Their key benefit is that it observes and measures regularly project performance comparing with the costs baseline. It includes monitoring and control of work progress, schedule and costs, in order to measure, compare and analyze schedule performance as well as budget performance variations in the actual spending.

The Software Quality Group (GQS) of the Universidade Federal de Santa Catarina in Brazil, leaded by Prof. Dr. Christinane Gresse von Wangenheim developed a game, with the objective to monitor and control a project using earned value management, named "Deliver!" The learning objective is to reinforce concepts and to teach the competency to apply knowledge on earned value management (GQS - Software Quality Group n.d.; Gresse-von-Wangenheim et al. 2012). Figure 2 shows the game board.

Figure 2: Earned Value Game Board developed by .

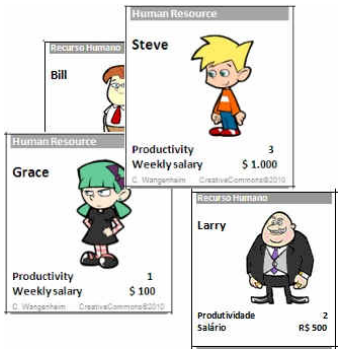


For this game, the classmates are divided in homogeneous groups of 2 – 5 people. Each team has a maximum approved budget or $ 20,000.

The instructions are following:

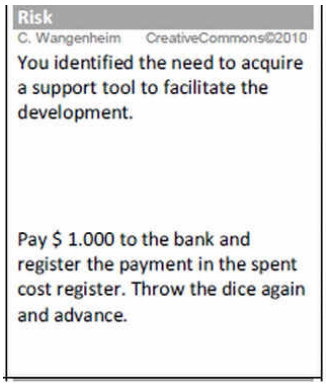
1. Each team selects its project team members from the pool of human resources available for all players. Each human resource has a defined a productivity (number of spaces that can advance in multiplication with the number obtained with the dice) and weekly salary, as shown in Figure 3.

Figure 3: Human Resources Cards for Deliver! Game.



2. Each team of players in turn throws the dice proceeding clockwise. The pair of players with the highest number starts the play.
3. The team advances the multiplication of the number of the dice with the addition of their human resources' productivity factors.
4. When the dice points is five or six, the team should take a risk card; this one influences in the project progress (see Figure 4).

Figure 4: Example of Risk Card in Deliver! Game.



5. The milestones at the end of each phase are mandatory stops. The pair of players has to realize a status meeting analysing SPI and CPI as performance indicators and forecast EAC.
6. The team who runs out of money is excluded from the game.
7. The winner is who first delivers the product to the customer arriving on the space "delivery".

Each team has some templates to play the game (see Figure 5).

Figure 5: Deliver! Templates.

PROJECT PLAN

Time planning

	Requirements Development	System Design	Implementation	Tests
No. of weeks *= no. of game rounds*				

Cost planning

Items	Requirements Development	System Design	Implementation	Tests
Human Resources per phase *= no. of weeks * Sum of weekly salary of all team members*				
Management reserve per phase				
TOTAL per phase				
PROJECT TOTAL (BAC - Budget At Completion)				

PERFORMANCE REPORT

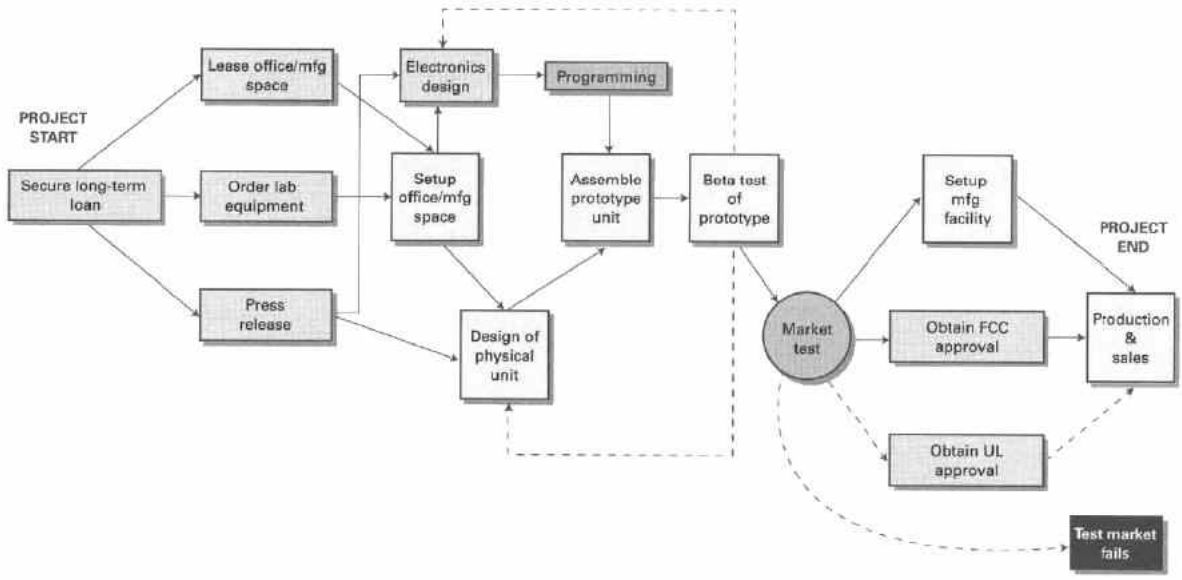
	Progress		Cost		Earned Value Management			
	Planned	Real	Planned	Real	EV	SPI	CPI	EAC
Requirements Development	REQ 100% completed							
System Design	DESIGN 100% completed							
Implementation	IMPL 100% completed							
Tests	TESTS 100% completed							

After two years using it for our project management courses, the feedback is positive, according to the cognitive objectives. Students showed great interest and enthusiasm in the games. The main concepts of the value analysis could be applied directly and quickly in a session of 1.5 hours. Understanding that this matter is rough for students, the game breaks this barrier.

2.3. Example of Project Management Board Game

For a broader perspective in project management, the game is “Copilot Portable Marine Radar Project” (Klastorin 2003). The game is played on a network diagram, as shown in Figure 6. This diagram works as a game board.

Figure 6: Network diagram for “Copilot Portable Marine Radar Project”(Klastorin 2003)**.**



The development of the game is:

1. Each team should define a team with technicians, programmers, assembly line workers and senior design engineers. Each sort of workers has different wages conditions and is necessary for different stages of the project.
2. In addition, each team should decide other options related to other resources as licensing technologies, acquisitions, etc., that affect to the project costs.

3. The results of the dice stablish the different options of the game in each element of the network, and for each time.
4. At the beginning, before the game start, each team ought to estimate the budget for the project; depending on it choose between different forms of funding.
5. A turn represents a week in the game. At the beginning of each “week”, each team makes hiring and firing decisions.
6. The game finishes when all teams have started commercial production of the new radar unit or withdrawn and the last team to enter the market has generated three weeks of sales.

The experience in the use of this game in our courses is:

- This game involves the students and allows applying numerous subjects of the project management.
- From a cognitive perspective, the game focuses mainly on matters such as time planning and controlling, also costs, resources, acquisitions and risks.
- If the teacher or instructor does not insist, players do not apply the acquired knowledge and simply "manage" the project intuitively.
- The game match needs a previous preparation, and at least two hours for playing.

3. Serious Game in a Project Context

Our experience in the application of serious games in project contexts is using Lego Serious Play®, both at the academic level and in project teams in engineering companies. The application of this method in the business world is very wide and diverse.

From its beginnings, Lego Serious Play® has been adopted by high profile companies, such as Google, eBay, The International Red Cross or NASA (James 2013).

In a study carried out within the European “Lifelong Learning Program”, the main areas considered for its use were project management, sales, marketing, social media or innovation training. The Table 1 shows the emergent themes for consideration for the pilot workshops (Mccusker & Newton 2012).

Table 1: Themes to be considered for Lego Serious Play® Workshops

Finance	Process	Product	Market	Personnel
Raising Finance	Growth Strategy	Innovation Capability	New Markets	Communication
	Quality / QA	Concept to Manufacture	Marketing Collateral	Team Building
	Change Management		Technology	Culture / Values / Identity
	Exit Strategy		Branding / Corporate Identity	Project Leadership / Management
				Self-regulation

Lego Serious Play® is based on basic principles and own philosophy (Mccusker & Newton 2012; Blair & Rillo 2016) The methodology consists of four steps:

1. Ask the question. The facilitator poses a challenge to the participants, which should be presented in a clear and concise manner, without giving an obvious solution.
2. Build. Models are constructed responding to the facilitator's question, based on what each participant knows and imagines about the business challenge.
3. Sharing. Participants share the models and stories they created.
4. Reflect. Reflection is encouraged as a way to internalize and connect creations with reality.

Following are the seven strategies that this methodology allows to do:

1. Construction of individual models.
2. Building shared models.
3. Creating a scenario.
4. Identification of connections between models.
5. Building a system.
6. Simulation of situation and decisions.
7. Development of conclusions.

Without deepening the possible strategies of the methodology, simply using the basic steps can address the key points needed to constitute the project. It is interesting to start by knowing if the project is interesting and / or viable before continuing. This teamwork allows us to identify and assess the different aspects that determine this viability. Likewise, it can serve to identify the different assumptions, constraints, hypotheses, ... of the project, as well to establish project alternatives. In certain cases, applying the method can identify the project manager and his team and, in addition, establish their responsibilities.

From the identification of the project to be performed, the Lego Serious Play® allows to develop the constitution form in a fluid way, allows you to start working to know what will be the scope of the project, the main deliverables and works, milestones and Some risks that we should consider.

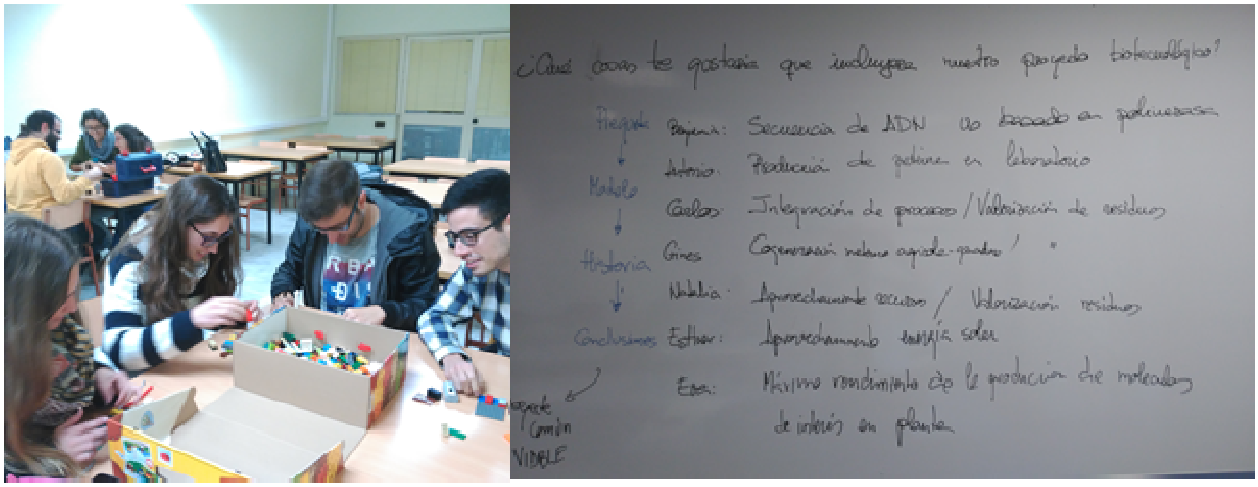
The initial focus of the application in different scenarios was always oriented to the feasibility analysis and development of project chapter. In this sense, the open questions were:

- What is the project?
- Who are the stakeholders?
- Which are the roles of the team?
- What risks could appear?

From the use of these questions, the teams have to develop the constitution of the project. This means constructing individual metaphors to analyze the different perspectives of the project. Subsequently, the common points and divergences in the idea of the project are analyzed. In a group, the methodology allows to create the scenario or to outline the scope of the project. The flow of the method aligns perfectly with the initiation of the project. The next step is to start building the project (system), simulating situations, and finally making decisions and drawing conclusions.

As additional feedback, in specific situations, where some managers do not support the use of project management methodologies, the use of Lego Serious Game® got a change in their attitude.

Figure 7: Lego Serious Play® session for project initiation.



4. Conclusions

In an academic level, from our experience the use of games for teaching has several advantages and few disadvantages:

- It enlarges participation.
- It increases students' motivation.
- It allows entering new or complex concepts.
- It consolidate foreground and allows put it into practice.

In all the games or serious games applied, the students' perception is very positive. The application of Lego Serious Play® allows that they identify the main elements of a project, define their owns projects, … The use of project management board games brings to the students a global vision about what project management means.

When we move the gamification methodology to the business world, the results are even better. Our experience is based on Lego Serious Play® and we discover new perceptions and behaviors in the project teams.

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