# Analysis Of Simulation Based Games To Teach Software Project Management

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**Abstract**— We have observed that we are lacking with tools for teaching and assessing Software Project Management. We need to develop some tools to educate capacity of Software Project Management and to allow learners to check their skills and cover needed educational purpose in risk free surroundings by using a game like methodology. A simulation can bring various benefits to software engineering education as it has brought to other educational fields. In this paper, various simulation based games for teaching software project management are reviewed and discussed in terms of description and outcome.

**Index Terms**— Games, Simulation, Software project management, Teaching.

## 1 INTRODUCTION

As the software industry is having extraordinary success in software development with increased scale and difficulty, it has also observed a stable and momentous stream of failures. According to us the main reason of this problem occurs in education: courses offering software engineering give no attention or give little attention to students for practicing issues around software engineering process. All the approaches for teaching subjects is based on two main mechanisms: lectures where the theory and concept of software engineering is presented; and projects where learners were divided into groups to develop parts of software.

The academic community has observed this problem and has created a means of innovations in response for standard lectures and project approach. These approaches fall under three main categories:

- An attempt for making the experience of projects same as they will encounter in real world.
- An approach to teach those specific subjects which the teacher feels missing and that are important for educating students.
- Simulated based approach where learners were allowed to practice software engineering in a computer based simulated environment.

Various main success factors for education based simulations are:

- For traditional methods in teaching, simulation should be used.
- Learners should have clear targets with the use of simulation.
- Simulation should have simple tasks at starting and difficult tasks at the last.
- Simulation should offer engaging.
- Simulation should provide reviews regularly.

As shown in table 1, there are six factors which describe the failure versus success rates. There are also some other factors except these six factors but these six factors are the major ones as they occurs many times.

Table 1. Major Factors for Successful and Unsuccessful Project

| SUCCESSFUL PROJECTS | UNSUCCESSFUL PROJECTS |
|---|---|
| Efficient project planning | Inadequate project planning |
| Efficient project cost estimating | Inadequate project cost estimating |
| Efficient project measurements | Inadequate project measurements |
| Efficient project milestone tracking | Inadequate project milestone tracking |
| Efficient project change management | Inefficient project change management |
| Efficient project quality control | Inadequate project quality control |

In today's life of children as well as adults playing of computer games or video games is very popular among them and it plays a vital role among youngsters. Games nowadays can be played anywhere using Smartphone, computers, laptop, gaming console, set-top box or television in a technological environment. We can say that people like playing games and if we are able to combine games with education i.e. "digital game-based learning" then they can learn more easily and quickly. Some games are:

- **SIMSOFT**: It is a printed board game which is based on Java language. Printed board game shows the flow of the game and java based game board shows the current as well as historical state of the project.
- **DELIVER!** : In this printed game board the learners are able to apply earned value management technique for developing the skills of learners so that they can measure and control the project's performance.
- **SimSE**: It is a game developed as a tool. This game is based on the simulation technique which mainly focuses on the development of capabilities of software process management.
- **SESAM**: It is like a software application. In this, the

learners learn software process management by using some of the simulation techniques. Player's role is Project manager which plans and control the project.

- **The Project Manager game**: This is a game which can be played online. Here, the players were able to allocate staff so as to complete a given project on time and within given budget.

## 2 LITERATURE REVIEW

Alejandro Calderon et al., discussed the requirements to develop tools for teaching scope of Software Project Management and how learners test their knowledge to cover the required objectives in an environment which is risk free by a serious game. They produced ProDec which is a simulation based serious game which improves on the limitations of similar proposals. ProDec is a flexible game which covers all the levels of Bloom's taxonomy and to allow learners to connect with the lifecycle of project.

Bhuvana Sekar et al., represents the advancement in gamification including computer games, digital gaming, game engine, etc. in several areas like education, training, learning, management, project management, etc. From the survey of authors, it is clear that the gamification is liked by the students a lot and they suggest using gamification techniques in software engineering courses. They also advise to include professional software designers and programmers into teams of project.

Jorge Marques et al., proposed an approach to teach and learn software project management in a practical way. The authors gave an experience of preparing learners to exercise their theoretical knowledge in a practical way. The approach proposed by the authors has four roles that are analyst and designer, programmer, software quality assurance and manager. They used four projects for four groups.

Amir Zeid et al., developed a model for distributed global software engineering simulation games. The model designed contains some factors that are time zones, users' cultural diversity, obstacles for location and issues on gender. These factors activate game that influences the virtual project's development. The implementation of this model is done by using the SimSE model builder. Developing software at remote sites gives an advantage that the users are able to use their knowledge and skills at various areas. General software engineering courses are able to teach by using simulation games. The authors displayed the main components of model and how it can involve educational factors and other experiments that influence the development of software in a distributed environment.

Emily Oh et al., introduced the SimSE model which is a graphical, interactive and educational software engineering approach that is able to teach processes of software engineering in a more practical way without having actual project. They discovered that by using SimSE learners are able to form a real understanding of processes of software and this allows users for exploring methods to manage the software process. This is like a logical approach where student was not able to learn in a practical and didactic way. SimSE contains three main parts: simulation model that contains some set of rules for simulation with specific situations, graphical user interface (GUI) that enables the user to interact with the simulation and simulation engine for executing the model.

Brian Wu et al., analyzed the published literature on game development-based learning approach with the help of game development frameworks with the viewpoint of outlining the guideline for using game development-based learning approach in courses, recognizing game development features and defining the creation of factors for efficiency in education. They examined the works on three characteristics that are process of teaching and pedagogical perspective, selecting game development framework, and assessing of game development based learning approach. They developed a guideline to use game based learning approach in education.

Pedro Letra et al., presented the process to identify the patterns in design of game that can be efficient in software engineering teaching, specially the topics that come under the course of software project management. They identified the association between patterns of designing game and functions for learning and teaching. They established this association among the functions of learning and teaching and education in software project management by questionnaires. Finally, an association is set up among the design patterns of game and education in software project management. The results accomplished in their work can be used in developing and designing games for education in Software Engineering.

Alexandar Nassal et al., proposed a general outline and a method which can be utilized to develop simulation games of project management for an academic objective in the domain of software engineering. They designed a general model of simulation involving features of ergonomic analysis, work psychology, learning theory and software engineering. Through this, they can simulate the working processes as well as the character of the developers. Using their framework of simulation is very easy as one does not needs to recognize the details occurring inside. One can continue with the previous elements of framework easily with the help of logic if there is a need to implement artifacts and activities.

## 3 TABLE OF COMPARISON

| Authors | Year | Description | Outcome |
|---|---|---|---|
| **Alejandro Calderon et al.** | 2014 | A comparison of previous serious games that are made for software project management training. | ProDec is produced which is flexible and simulation based game. |
| **Bhuvana Sekar et al.** | 2014 | The analysis of current status of game applications is done. This analysis motivated the authors to achieve new methods for gamification. | Gamification is loved by the students and they advised using gamification techniques in software engineering courses. |
| **Jorge Marques et al.** | 2015 | An approach for teaching and learning software engineering is defined. SPARTA approach is used here. | An overview for the requirements of their approach is given. |
| **Amir Zeid et al.** | 2015 | A model for distributed global software engineering simulation games is defined. The implementation of this is done with the help of SimSE model builder. | The proposed model is used to discover factors of success, advantages of distributing development of software and distributing work among different sites in an effective way. |
| **Emily Oh et al.** | 2015 | The SimSE model is defined which is a graphical, interactive and educational software engineering approach that teaches processes of software engineering in a more practical way. | With SimSE learners are able to understand the processes of software and allow users to explore methods for managing the software process. |
| **Brian Wu et al.** | 2012 | The use of changing, or modding the previous games for learning courses is defined. They define two exploratory case studies of game modding for illustrating knowledge learned by the learners. | Using game modding will encourage learners to learn and permit them to use concepts for the utility and applications. |
| **Pedro Letra et al.** | 2015 | The process for identifying the patterns to design game for software engineering teaching is defined. | A procedure to collect and authorize a pattern set for designing game in Software Engineering Management is described. |
| **Alexandar Nassal et al.** | 2014 | A general overview and a method which can be used for developing simulation games of project management for an academic objective is developed. | Allowed modifying the life cycle models making the simulation of previous developing strategies possible. |

## 4 Conclusion

In this paper, it has been concluded that there is a need for developing tools or games for teaching and assessing software engineering courses. It has been analyzed that the simulation based games can be used for this. There are various previous games developed for this purpose. One can continue building simulation based games for teaching software project management. Various simulation based games are compared to analyze the concepts and outcome of the games designed for software engineering.

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