

Using Serious Games to Replicate Scrum Framework in Daily Software Development Practices

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Abstract—Even as software development companies increasingly more adopt scrum, enforcing and improving these in exercise remains troublesome to many businesses. Scrum provides a framework of activities, practices and standards, to apply it when you need to trade the mind-set of the employees. Serious games consistent with the participants can be used even as adopting the usage of an enhancing scrum framework. Maximum vital is attending to the real trouble or goal of an enterprise before beginning the studying intervention using serious games. Participants noted that the primary cause of significant video games is growing attention followed via letting the newbies practice training learned. To finish, serious games aren't the best answer to the problem but they are a tool to attain your aim.

Index Terms—Scrum framework, serious games, education, training, simulation

I. INTRODUCTION

An increasing number of corporations are switching from conventional software development strategies to Scrum software program development techniques to undertake, use and enhance scrum methodologies in day by day conditions nevertheless problems companies. Scrum presents a framework of activities, practices and standards. To apply one of these framework, it requires an alternate in thoughts-set [12]. There may be an excellent distinction among traditional software improvement techniques and Scrum software development strategies. General characteristics of conventional software improvement techniques encompass massive documentation, lots of in advance making plans and the levels which are subsequent. Scrum techniques have given a set of various characteristics, which promote self-organizing groups and the purchaser's function being important for achievement [5]. Scrum software improvement is based greater on tacit information than traditional software program improvement. This type of knowledge is tough to switch to different people and co-employees [1]. Shifting tacit information is expensive as it desires to be achieved at the task through close interaction, training and direct conversation [7]. It's far difficult to analyze the use of Scrum framework from books due to the fact Scrum challenges management techniques depending on procedural information. Procedural information is involved with understanding how, and consists of the capacity to carry out skills [6]. Serious games and simulations might be beneficial in gaining procedural information and declarative understanding.

Scrum games/simulations are simulations with described learning consequences for education and gaining knowledge [9]. Serious Scrum Games are already utilized in education and coaching Scrum tasks control strategies. Daily stand-up meetings, planning, sprints and portfolio control are simply numerous examples of practices that may be trained the use of serious games. Serious games designed for training scrum techniques may be used to make Scrum techniques more specific and those games allow individuals emerge as acquainted with the practices and activities.

II. THEORETICAL FRAMEWORK

Implementing to the area of software program development, an agile way is the capability to react and adapt to adjustments in requirements. Scrum software development are used to assist corporations and organizations respond to the changing environment. "Scrum is a manner for groups to work together to expand a product. Product development, the usage of Scrum, happens in small portions, with every piece constructing upon previously created portions. Building products one small piece at a time encourages creativity and allows teams to respond to remarks and change, to build precisely and most effective what is wanted" [10].

Scrum software development strategies emphasize on continuous improvement, making the team members act intelligently. This method, called retrospective, has a set region in each methodology. Throughout this retrospective the group attempts to discover how they could enhance their present day manner of operating as a group. In this meeting questions are asked like, what went well, what may want to continue better and what might be advanced for the future. A scrum group is in a continuous circle of improvement.

Gaining knowledge is the technique of obtaining and/or adapting knowledge, skills and behavior. For powerful study to take region the learner desires to be actively concerned and encouraged, the activities want to be relevant to actual life and person variations are taken into consideration. New information is greatly understood while it could be associated with current knowledge. Self-law, the system in which the learner is reflecting on its own studying and placing clean goals performs an important role in getting to know [11]. In 1956 Benjamin Bloom developed the taxonomy of instructional objectives. This taxonomy is later revised by Krathwohl and Anderson in 2001 [8].

Bloom identified numerous layers of mastering, regularly visualized in a pyramid. The six layers within the revised taxonomy encompass: remembering, information, making use of, analyzing, evaluating and growing.

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Essential to this model is to grasp a better stage, the learner desires to master the lower stage. First the learner wishes to collect the primary statistics/understanding approximately a positive topic and create an understanding before he or she can critique or create new know-how on that topic. The revised Bloom taxonomy identifies four expertise domains: actual information, conceptual information, procedural expertise and metacognitive information.

While getting to know Scrum methodologies from text books and presentation slides, the learner is inside the bottom layers of the model, remembering the information. While having found out the basic information approximately, the situation the learner needs to use the classes found out into daily conditions. Serious games can be used to make the transition from understanding to making use of information simpler. Serious games permit newbies to apply the lessons found out in a fictional surroundings. In this manner beginners get arms-on experience with standards like running in an iterative way, early remarks and patron involvement.

The reason why serious games can fluctuate, feasible purposes of serious games are: education, training, raising recognition and reflection. An instance of a serious game used in education Scrum strategies is "Mission to Mars", a Scrum launch planning game [2]. Mission to Mars is a physical game, which participants need to be in a single room to play the game. According to Kruchten, "Mission to Mars is an academic board game illustrating the making plans method in iterative software improvement; It brings collectively concepts including: new release (sprint), backlog, story cards and story points, velocity (productivity), effect of defects, technical debt, and risks". The game is performed using a fictional surroundings, a spaceship has crashed at the living base and this desires to be rebuild in 8 weeks. Members need to set priorities and plan how to rebuild this base. Part of this game is a reflection second on the end of the game. This game takes approximately an hour to play.

III. RESEARCH METHODOLOGY

The purpose of this research is to examine how serious games can be used to raise consciousness, teach and replicate on Scrum project control methods in practice, with a purpose to examine how these games can be used by the writers which defined a major research query. The primary question of this article at is:

How can serious games be used to elevate focus, educate and replicate Scrum framework in practice?

To be able to examine the current state and gaps in research, a literature examine is performed. At some point of the initial literature study, the authors observed challenges whilst implementing Scrum challenges management strategies. Those demanding situations include much less documentation and extra tacit information whilst the usage of Scrum methods and the need for the appropriate subculture and mind-set [3, 5]. One way to overcome those challenges may be using serious games. The ones games may be used to allow people practice the process and let them get to know with specific practices. To analyze how serious games can be used in exercising semi-dependent interviews with professionals are used. The research approach for this article undertaking is grounded idea, developing idea with the aid of

analyzing styles in empirical facts [13]. While acting grounded research coding is executed in three ranges: open coding, axial coding and selective coding [5]. Open coding is the manner of labelling data. In this level, the author labelled the data and the usage of QDA Miner, a qualitative statistics analysis application. The information is located in different categories. Axial coding then is the process of rearranging the codes and classes into a hierarchical shape. This level is about relationship between classes, subcategories and codes. On this stage, codes are taken care of and categories are rearranged. The last stage is selective coding; "on this stage the emphasis is placed on recognizing and enhancing the relationships among the primary classes which have emerged from this grounded technique in an effort to expand an explanatory theory" [6]. When coding the statistics from the semi-structured expert interviews, all three tiers of coding are used. The data from the role descriptions and game descriptions is coded at some point of the desk research phase by using open coding. This provided the writers a mapping with essential capabilities in role descriptions and capabilities educated mainly games. To examine the records from the interviews the author coded the transcriptions by using the earlier cited three levels of coding: open coding, axial coding and selective coding [3]. At the beginning the published transcriptions were analyzed and crucial sentences have been highlighted with a written description of the finding. Then the author digitalized the codes using QDA Miner, creating basic classes. The second step changed into reading the codes and creating primary classes and subcategories. At this step the codes were placed in classes and some codes had been merged.

IV. RESULTS

The codes from the interviews are classified into different stages and subcategories. The principle stages consist of: Scrum methodologies, training, serious games, and studying and destiny studies.

The entire times of codes per category are Serious Gaming (101 times), training (59 times), scrum framework (27 times), and studying (3 times). The overall quantity of used codes is 64 and the whole frequency of times is 211.

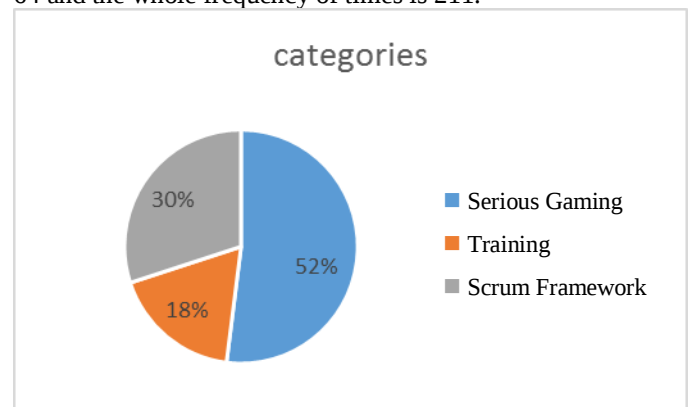


Fig. 1. Percentage per Category

A. Serious Gaming

With 52% this is the class with highest quantity of times. The class serious Gaming has the following subcategories: reason (45 instances), characteristics (16), success factors

(13), type (13), Mechanics (13), Fail factors (1) with a complete of 101.

Focus is mentioned 13 times by using the participants, accompanied via making use of concept/expertise with 10 instances.

Developing awareness is the most noted reason of serious games used to train Scrum methodologies.

The individuals also noted a few characteristics of serious games (16 instances). Those traits include a fictional environment, the games are physical with a couple of individuals in one room and there may be no Scrum method prescribed.

A success factor for serious games is cited thirteen times. It's far really crucial that the newbies take domestic the lessons discovered from the usage of serious games and observe it into every day conditions.

Contributors additionally stated some types of games that are used or no longer used as in computer games. These types consist of customized games, the use of or now not using a pc game and Lego games. Trainers re-use the existing games and personalize those video games to excellently serve the employer.

Serious games have several mechanics, one of those mechanics is a reflection moment, a second for contributors to look again and see what they could improve. In most serious games a role is appointed on the members. Other mechanics are glide and growing complexity.

One of the participants also referred to a fail thing for games, which is making the sport to complicate. When a recreation is to complex the contributors get annoyed and the game will lose its strength.

B. Training

The second category, training has the subsequent subcategories: success factor (33), measurement/strategies (8), types (7), technique (6), and project (5) with a complete of 59 instances.

The case corporations additionally cited numerous factors for a successful training. The factors cited for a hit education include the maximum noted code, searching into the actual problem (18 instances). For an effective training to take area, the instructor has to understand the real problem or goal of the organization. Two associated elements are the significance of the consumption and the intake affords mirrored image gadgets. The items collected during the intake are used to influence the reflection moments in the games.

The case agencies use several strategies for measuring. Methods for measuring the final results of the training and strategies for reading the contemporary state of commercial enterprise. Those dimension techniques include remarks on teacher/education, assessment, comply with-up, Scrum maturity experiment and a SWOT analysis.

There are several types of training aside from training with using serious games. Participants mentioned education for training the fundamentals (4 times), to create a common language among contributors. Members also mentioned training for getting a certificate (3), a number of those have prescribed training material like slides and exercises.

The participants noted frameworks for channeling the consumption, the execution of serious games and trade tactics. Those frameworks include 8-area model (3 instances), interviews (1), V-model (1) and the VIE technique (1).

C. Scrum Framework

The category A. Scrum framework has the subsequent subcategories: achievement factors (14), and challenges (11) with a complete of 25 times.

The elements that make implementing and using Scrum strategies are: a success encompass having a Scrum champion, somebody that pushes the scrum adoption forward. Enforcing Scrum also works higher if it is accompanied with a trade technique, and the business enterprise desires a tradition that supports changes. Involvement of control is really crucial for a success implementation and bosses want the awareness on team key performance signs (KPI's) in place of individual KPI's. Enforcing and the use of Scrum methodologies also bring few demanding situations like resistance to trade, rare involvement of control and managers focusing on individual KPI's.

V. DISCUSSION

The findings discussed in this section are: getting to the real problem, measurement of training outcomes, requirements of Serious Games, the purpose of serious games, and the role of games in Scrum transformation.

A. Measurement of Training Outcomes

In this section we discuss about getting to the real problem and size of training results.

As stated earlier the use of serious games isn't the best solution to the problem/goal an organization might have; But by using serious games companies try and reach their goal. The best way of comparing which has been used, was a form to assess the teacher and the education. [4].

For an instructor and the company sending personnel to schooling, this is a truly exciting stage. At this stage you need to degree the knowledge, mindset and behavioral changes as a result of training. Talents, attitude and behavior want to be measured earlier than and after the training. Measuring on this stage can consist of surveys, questionnaires or tests. In keeping with the paper of Stikkolorum [7], trade in skill may be measured by means of the use of a pre-check and submit the result to take a look at. In this example, software layout competencies have been efficaciously measured by using an internet survey. The survey consisted of more than a few questions testing the design talent of students.

Dimension at the final two stages diagnosed via Kirkpatrick is probably too steeply-priced or time ingesting for companies but offers treasured data. Degree three, exchange in on-the-task behavior, in line with Kirkpatrick is the most hard and most crucial one. While individuals have learned something in training however do not observe these classes discovered then the training has been a failure. Measuring on this level is vital to degree the trade in behavior and detecting motives why there isn't an exchange behavior [4]. To assess stage 3 of Kirkpatrick, groups should use surveys earlier than and after the training. The instructor

desires to present individuals time to time to change their behavior. For groups, sending personnel to education degree 4 is in the long run to the maximum important one, outcomes. Businesses don't ship personnel to training to simply have a pleasant day, they want to see a few consequences after training. Effects in this stage are being monitored such as: reduction in fees, improved sales, progressed quality and return on investment (ROI) [4]. Serious games builders already use numerous equipment for dimension. Builders of videogames already construct-in measurement methods of their serious games. Those games consist of pre-recreation, in-recreation and submit-recreation assessments. Serious games offer a super platform for size of training results but trainers, by the use of bodily serious games, ought to research from the measurement strategies utilized in those games. The pre-sport and publish-sport evaluation could also be a good dimension technique for measuring abilities, attitude and behavioral exchange.

Measuring the effectiveness of education is easier whilst the intention of education is getting a certificate. In this situation effectiveness of education is measured by means of the range of participants getting a certificate. The trainers, coaches and experts of the case companies had been measuring the training effects inside the form of a survey. This survey is used to enhance the training however does no longer degree any trade in competencies, attitude or behavior of the contributors. Measuring this transformation in competencies, mindset and behavior provides the business enterprise with valuable data. The authors believe that using a pre-take look and put up-test to degree the actual effects of training, desire to be part of an education software. The use of a survey to degree the learning improvement appears promising [14].

B. Purpose of Serious Games in Scrum Training

Consistent individual serious games can be used for numerous functions inclusive of creating recognition, placing theory into practice and changing mind-set and behavior. Creating awareness and changing mind-set and behavior are carefully related collectively. This cognizance is used to make users of serious games recognize how they're behaving and the way they can enhance this behavior. When using serious games for training and changing behavior and attitude, it's far crucial to have all of the newbies physically in a single room. Interaction among students is critical and consequently no computer games are used as mentioned by means of participant. Serious games can be used in aggregate with theoretical getting to know. Books and shows could be used to gain declarative knowledge of Scrum methodologies. Critical games could then be used to get revel in, procedural know-how, with the sports used in Scrum [6]. Serious games permit members positioned idea into exercise and let them emerge as acquainted with the practices and activities.

C. Role of Serious Games in Scrum Framework

Scrum transformation, adopting, using and improving Scrum methodologies continue to be troublesome for many agencies [8]. Literature and the participants agree that introducing Scrum brings some demanding situations. Those demanding situations consist of tradition, resistance to

alternate, lack of information / no experience with Scrum and involvement of control [5]. As described via individuals, successful adoption of Scrum methods calls for having: 1. A Scrum champion, a person who is certainly believing in the advantages of scrum and looking to match it to their corporation, 2. Involvement of center and pinnacle control and 3. Creating a subculture for trade. Serious games can be used to overcome sure boundaries and challenges whilst adopting with the use of and improving Scrum methodologies.

Lack of knowledge or experience with Scrum methods may be solved while using serious games in education. Serious games like Birdie show beginners the fundamentals of Scrum development but there are additionally more unique games to teach for example: Scrum portfolio management. Serious games permit participants practice at the procedure and practice the classes learned. This offers contributors the procedural information, the knowledge of how to carry out a positive movement [6].

D. Discussion of Research Questions / Executive Summary

How can serious games be used to raise focus, train and reflect on Scrum project management strategies in practice?

The aim of this part is to analyze how serious games may be utilized in practice. In line with literature and the case groups, serious games may be used in exercise if at least the following necessities are met: 1. A trainer, coach or representative desiring to get to the real problem/aim of the business enterprise at some point of the consumption technique and verify this problem; 2. The game consists of reflection moments, to improve the in-recreation overall performance and to transfer the training found out in the game to on-the-task conduct goals; 3. The game does not replicate the actual existence environment and game developers don't need to rework the present corporation. The usage of a fictional surroundings prevents individuals to oppose the game because it is not 100% equal; 4. The complexity of the game desires to growth each round. Members examine when gambling the game and improve their overall performance consequently the complexity of the game needs to boom each round to hold members involved; 5. The participants, a group wishing to be physically together. A computer may be used to switch expertise but in case you need to exchange mindset and behavior the team desires to be physically collectively; 6. The modifications in abilities, attitude and behavior need to be measured the use of a pre-game and submit-game survey to degree the effectiveness of training. An interview is held with some of the members and the control team to evaluate whether the intention has been reached or the problem has been solved. The consequences would be in communication with members.

Serious games may be used to create focus and to get procedural information before using Scrum methodologies in real lifestyles conditions. This is a valuable, powerful and danger-loose manner of studying a way to follow the practices and concepts of Scrum software program development methodologies.

Below is the authors' vision on the way to use serious games to raise focus, educate and mirror on Scrum mission

management methods in exercising the education application is split in pre-training, schooling and put up-training. Throughout pre-training it's far most vital to get to the real aim of the enterprise and verify it with the individuals of the education. On the training phase, the emphasis is on the learning intervention, the serious game and reflecting on the training discovered and moving those training learned from the game to a change in on-the-process behavior. Post-training focus want to be on measuring the final results of training through using a publish-education survey and an interview with contributors and the management group.

VI. CONCLUSION

Serious games are an extraordinary tool to make Scrum more specific and to come to be familiar with the practices and activities. These games permit human beings enjoy the blessings and opportunities of Scrum methodologies but also can be used to train a set of competencies like collaboration, teamwork and time control. As mentioned in advance, it is in reality essential to appearance and cognizance on the real intention or hassle that and company has. Interviewing people and looking at the team offer the instructor with enough records and recognition factors to pick out the precise getting to know intervention. For an effective getting to know intervention to take area that is essential.

The outcomes of the interviews display that it's far tough to degree the effects of training for an outside consulting or training organization using physical, board and/or position playing games. This is because of important reasons; the primary one is that maximum critical games are performed by external specialists or professionals. When the change procedure/education is finished they leave the organization, so it is hard to look for the effects in phrases of return on funding. 2nd, they locate it clearly hard to measure the behavioral trade and business results as an outcome of training. Literature shows the way to measure the consequences of training when using serious video games with pre-recreation, in-game and publish-game dimension methods.

This article shows how companies may want to use severe games for training, growing focus and reflecting Scrum methodologies. Serious games could really help trainers, Scrum coaches and specialists in the method of adopting, using and improving Scrum software improvement techniques.

VII. FUTURE WORK

Future studies can be done close to measuring education results while the use of serious games. Currently no one of the taking part organizations had a tool for measuring the enterprise outcomes and behavioral changes after using a serious game or enterprise simulation. Measuring the actual commercial enterprise consequences, because of training, might be too high-priced for groups. Measuring what to increase mastering has took place gives organization perception within the advantages of training. Checking if training has the favored consequences and the education changes participant's abilities, attitude and behavior. Destiny studies may be carried out on the proper approach of comparing to what amplify learning has happened.

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