



An Experimental based Study on Challenges of Game Development with Scrum using Agile

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Abstract— *The purpose of this paper was to scrutinize the critical issues and challenges that might happen in development processes of game with Scrum using agile approach. In this paper the author also tries to provide management guidelines to overcome barricade in accepting the Scrum process as an upcoming game development method. A qualitative research method was designed to take over the knowledge of practitioners and explore the Scrum game development process. A thorough case study was carried out in two organizations where the Scrum process was fully incorporated in every division of two organizations' game development processes. First organization was based on large-scale game development applications and the other provides small- and medium-scale game development applications. Disparity among two organizations provided constructive differences for the data analysis. Finally as a future study the author is proposed a new scaffold for a blend game development method this may nullify the challenges of scrum process.*

Keywords— *Scrum, Agile Methodology, Game Development, Sprints, Traditional Methods, Research Method*

I. INTRODUCTION

The innovative time of video game development have all but disappeared. In today's' rush most of the developers make some mistakes. The behemoth of mistakes eats the zeal of awfully talented people who enters the game development industry.

In this paper, we'll look at the history of game development and how it has changed from individuals making games every few months to multiyear game projects which demands for more than 100 developers. Over the past decades, many game development methods have been shaped and make use in the game industry. Each technique has diverse characteristics and features that differentiate it from other processes. Process can be classified as either a heavyweight or a lightweight method [1]. The heavyweight method includes traditional methods like waterfall model. In contrast, the lightweight methods are also known as agile methods.

In this paper the authors identify the negative aspects of agile methodology which have failed to prove their worth in the game development organization.

A. History of Game Development

In the initiation, video game development didn't have need artists, designers, or even programmers. Near the beginning of seventies, games were hardwired gears together by electrical engineers for a specific game. Technological advancement lead to game manufacturers discover cheap microprocessors for offering a way to create more complicated games, this lead to movement of logic from hardware to software platform. This alteration turns the game developers to programmers [2].

In 1965, Gordon Moore, the cofounder of Intel, defined a law that predicted that the number of transistors that could fit on a chip would continue to double every two years as shown in Figure 1 [3]. Each generation of game development bought new capabilities and capacities according to Moore's law.

B. Traditional Method

In the dawn of video game development, a game could be quickly developed in mere months. As the game hardware became much convoluted, the cost to create games goes up. For example, the enhancement in the graphics allowed more featured and colourful images on the screen, this implies software and art production became the cost factor for releasing a game.

To reduce this increment of risk factor of cost, many organizations adopted traditional waterfall model as shown in Figure 2 [4]. The waterfall model works with the idea of developing large software through a sequence of phases. Many game development projects use this approach for development. Figure 2 given below shows the waterfall model for game development.

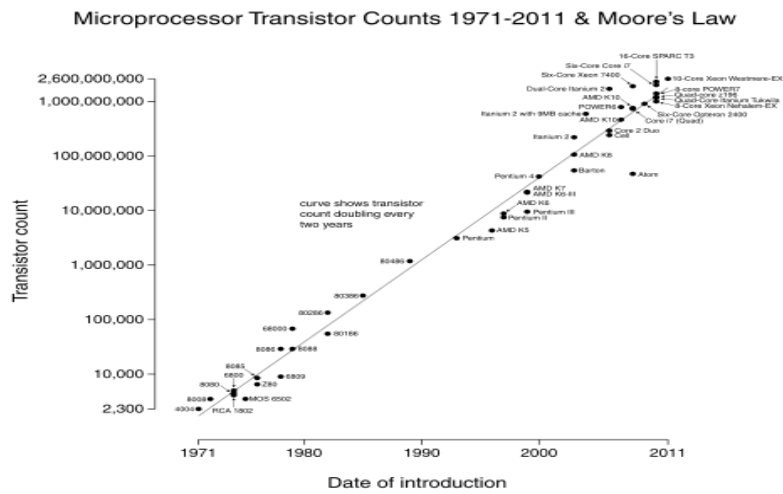


Figure 1: Transistor Count and Moore's Law

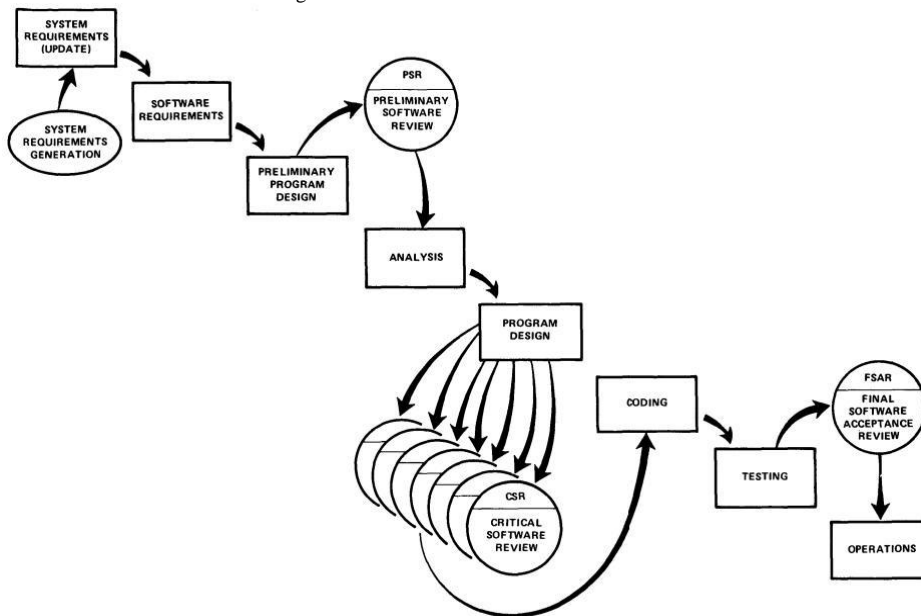


Figure 2: Original Royce waterfall model.

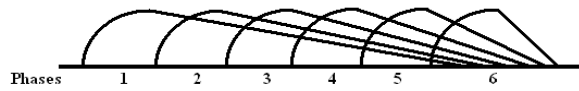
C. Agile Methodology

Projects that follow traditional approach go over budget and/or not succeed to stay on given calendar time. Most games developed are not fruitful. The Crisis facing game developments using traditional approach have merely following problem: lack of innovation, less game value and a retrograde work environment for developers [5].

The above problems are overcome by using a new iterative and incremental approach known as *agile methods* or *agile software development methods (ASDMs)* as shown in Figure 3. These methods gathered the set of principles called *agile manifesto* which are as follow [6]:

- **Individuals and interactions** over processes and tools.
- **Working software** over comprehensive documentation.
- **Customer collaboration** over contract negotiation.
- **Responding to change** over following a plan.

Iterative Approach: Overlapping Phases of Development



Source: Adapted from H.Takeuchi and I.Nonaka, "The New Product Development Game", Harvard Business Rev., Jan 1986 pp. 137-146

Figure 3: Agile Iterative Approach

The development to ASDMs started in the mid-1990s, in parallel by various experts, in discrete languages, distinct locations, and different project environment. Table 1 shows country names and founders associated with various agile methods.

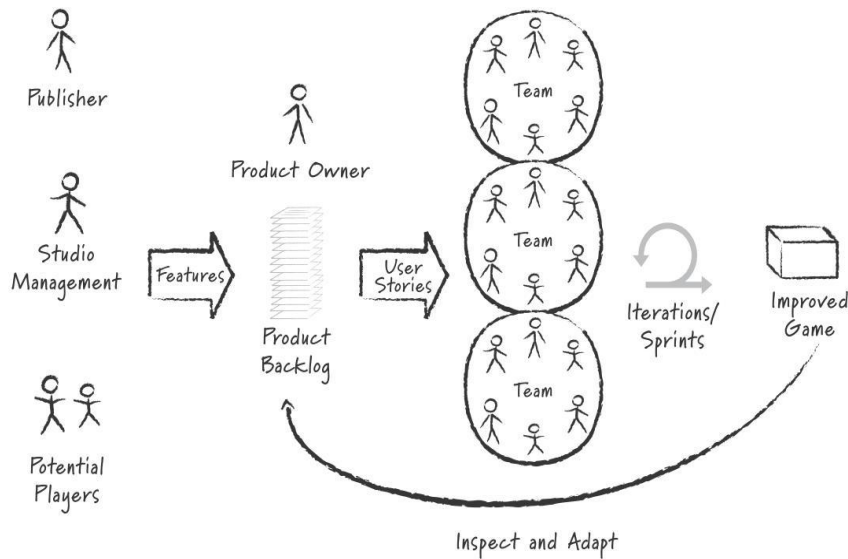


Figure 4: Agile development flow

TABLE 1
LIST OF ASDMS

Country	ASDMS	Founder
U.S.A	Extreme Programming (XP)	Kent Beck, Eric Gamma
	Scrum Method	Ken Schwaber, Jeff Sutherland
	Adaptive Software Development (ASD)	Jim Highsmith
	Lean Software Development	Tom and Mary Poppendieck
Europe	Dynamic Systems Development Method (DSDM)	Dane Faulkner
Australia	Feature Driven Development (FDD)	Peter Code, Jeff DeLuca

D. Scrum

The origin of term *scrum* came from the sport rugby, in which each team have fifteen players who compete against each other. This word scrum used for getting an out-of-play ball back into play in rugby, it was first used to describe hyper-productive development processes in Japan [7].

The scrum game development method is an agile process manages game development using iterative and incremental approach [8], [9], [10], [11], [12]. A Scrum game project makes growth in sprints as shown in Figure 4. These iterations are the life of the game project. Sprints have a fixed duration (time box) of two to four weeks [13]. In general, objective of the sprint is known as its *sprint goal*. At the end of the sprint phase, the whole team shows a new improved version of the game to the stakeholders (A *stakeholder* is someone who has a stake in the outcome of the game project and it includes people on the publishing side, other team members of the game project, and studio

management [14]). Sprint includes design, coding, asset creation, tuning, debugging, and optimization—everything required to produce a shippable game.

It is very important to care for the principles of Scrum [15]:

- **Empiricism:** Scrum uses an “inspect and adapt” cycle that allow the team and stakeholders to respond in real time.
- **Emergence:** The sprint review and planning cycle is made in such a way to maximize its features of a working game.
- **Timeboxing:** Scrum is iterative and delivers value on a regular basis to synchronize the project as value transpires.
- **Prioritization:** Scrum game projects based on player priorities who will buy the game.

A Scrum team involves of a ScrumMaster, a product owner, and a team of developers as shown in Figure 5 [16]. The *ScrumMaster* is in charge for educating the team about Scrum and makes sure the members follow the drills established for them. The *product owner* is solely responsible for take advantage of the return on investment (ROI). The *team* provides a bunch of features from the product backlog. Developers are part of team and they define how much work they can pledge at the start of a sprint and take charge to deliver the completed work by the given time. Table 2 shows the roles for each Scrum Team.

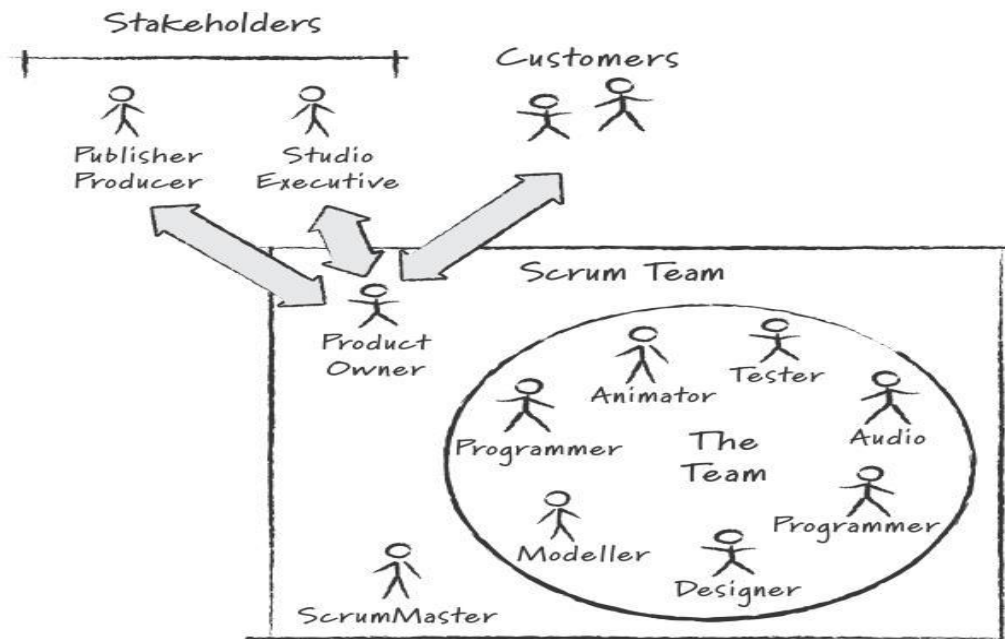


Figure 5: Scrum Roles

E. Quantitative Versus Qualitative Research Methodology

Quantitative methods start with a logic that variables can be recognized and relationships can be calculated. This approach usually employs mathematic models, hypotheses and theories to simplify research conclusion. On the contrary, qualitative methods rarely commence with hypotheses and theories and complicated to measure. This method make use of non-numeric data, such as questionnaires, field notes, conversation, participant observations, questionnaires, documents, texts, recordings, photographs, interviews, memos, and researcher’s reflection and reaction [17], [18], [19]. Differences between Qualitative Method and Quantitative Method are shown in Table 2 [20].

TABLE 2
QUANTITATIVE METHOD VS QUALITATIVE METHOD

Categories	Quantitative Methods	Qualitative Methods
Assumptions	<ul style="list-style-type: none"> • Social facts have an objective reality • Variables can be indentified and relationships measured 	<ul style="list-style-type: none"> • Reality is socially constructed • Variables are complex, interwoven, and difficult to measure
Research Purposes	<ul style="list-style-type: none"> • Generalizability • Causal explanations • Prediction 	<ul style="list-style-type: none"> • Contextualization • Understanding • Interpretation

Research Approach	<ul style="list-style-type: none"> • Begins with hypothesis and theory • Uses formal instruments • Experimental • Deductive • Component analysis • Seeks the norm • Reduces data to numerical indices • Uses abstract language in write-up 	<ul style="list-style-type: none"> • May result in hypothesis and theory • Researcher as instrument • Naturalistic • Inductive • Searches for patterns • Seeks pluralism, complexity • Makes minor use of numerical indices • Descriptive write-up
Research Role	<ul style="list-style-type: none"> • Detachment • Objective portrayal 	<ul style="list-style-type: none"> • Personal involvement • Empathic understanding

II. RESEARCH METHODS AND PROCEDURES

In this paper author uses a qualitative method for data inspection under the case study. The Scrum method in both organizations was incorporated in all aspect of their game development processes, including planning, analysis, and design, coding and testing. One organization produces large-scale gaming applications and called the PQR firm, while the other small-scale organization will be called the WXY firm. The PQR firm has been providing games mainly under category of racing, management, mission-based and on sports. On the other hand WXY firm provide mainly internet based games.

As discussed previously, PQR firm and WXY firm operate in different souk with different types and sizes. The duration for game development at PQR firm is longer than one at WXY and the average duration of game at PQR being 12-18 months and at WXY 3-4 months. PQR make use of various programming languages, such as C, C#, C++, Java and Perl for different operating systems. WXY mainly prefer Java and HTML-based web programming languages for development of games.

To assemble data, three types of data were collected from above two firms. First, observations were conducted through on-site visits and field notes of game development process. Secondly, an email survey was conducted among games developers and managers. Finally, a proper face-to-face interview was performed with project managers, lead developers.

Collection of data was primarily focuses on issues and challenges of Scrum. It sought information on scrum team (ScrumMaster, a product owner, and a team), the Sprint review and Scrum the flow process.

III. DATA ANALYSIS AND RESEARCH RESULTS

This part illustrates the analysis of data that was studied for two firms that put Scrum into practice in their game development processes.

Process of data analysis includes mainly three levels of phases. At first level, all the data produced by documentations, email surveys, observations and interviews were examined by concentrating on the issues and challenges of Scrum. At the second level, the codes were reviewed in which the concepts were planned and the documents were re-read and analysed. The final stage of data scrutiny includes *axial coding* [21] which depends on an artificial technique of building links between categories and subcategories for building detailed scheme. At this stage, all the codes were compared, grouped, sorted and searched. In below Figure 6, it shows the process of data analysis.

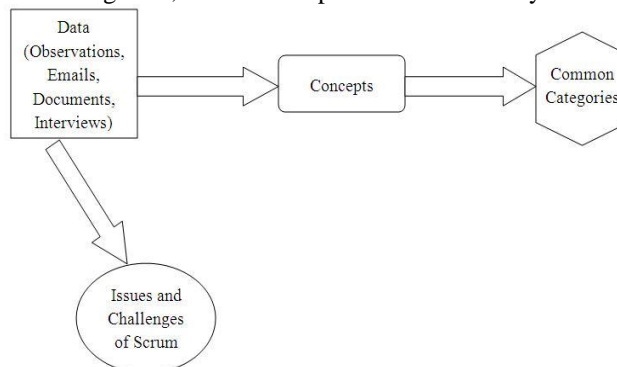


Figure 6: Process of Data Analysis

IV. DISCUSSION AND MANAGEMENT GUIDELINE

The following section shows the concept of Scrum game development challenges which are discussed below.

- **Team Management:** Scrum was not much effective in language of progress time and costs, during the start of two months.

- *Lack of Accountability:* An important characteristic of the Scrum method is the ability to check the progress of each project at every even week depends on duration of sprint, however in the Sprint mainly task do not get completed as planned and carried to the next Sprint Meeting.
- *Trust and Confidence:* Trust and confidence is a topic perceived between developers and Scrum masters. A Scrum masters' role is to help developers, by given that what developers require, or by eradicate developer's obstruction. It seems that developers want to have a Scrum master who does the job.
- *Scrum Framework:* Daily Scrum meetings are part of this framework. More than a few developers assert, "there was no necessity to have daily Scrum meeting when there were no detailed schema to discuss".
- *Documentation:* Implement the Scrum process, the amount of documentation was reduced significantly. A definite amount of documentation is useful when game developers work on a difficult project. Sometimes the compact amount of documentation is a big pain to bother.
- *Working Environment:* Open working environments for the Scrum method because it supports communication facilitates, and helps developers to get together. The majority of developers do not like this kind of work environment because of cubical setting and disturbance on their work while their workmates talk to other workmates.
- *Collaboration:* As Scrum team is positioned at one place, it may causes collaboration problems between far-flung site developers.
- *Training:* One of the biggest problems that were faced in Scrum game development is new employee training.

The following section provides management guidelines for those organizations that plan to implement Scrum in the future [1].

- When a new Scrum team is organized, managers must consider whether each team member's knowledge and skills are pertinent to the project the team members are going to work on.
- The project manager should not be a bottle neck to Scrum teams due to his/her multiple responsibilities in other areas that are not directly related to the team project.
- New employees should be given enough time to understand both the existing systems and the Scrum method before they get into a project.
- A self-managing Scrum team still needs a supervisor who has authority to get developers to work faster and harder.
- Project managers should monitor if there are any trust and confidence issues among developers, and between Scrum masters and developers.
- The duration and rules of the daily Scrum meeting should be strictly observed; the duration of other Scrum meetings should be dynamically adjusted based on the agenda for efficiency.
- Lack of documentation is a source of problems, especially for large-scale and complex projects. The philosophy of the Scrum method which reduces documentation significantly should be tailored. Organizations need to determine how much documentation is adequate for their projects.
- Open-space working environments promote teamwork and communication, but organizations should come up with methods to help developers deal with environmental distractions.

V. CONCLUSIONS

This paper identifies the important categories of critical issues and challenges that may affect the quality of the game in agile methods. This paper also provides the management guidelines to help organizations to use Scrum method as a future game development method by overcoming the barriers of issues and challenges of Scrum as discussed in above sections. Limitation for this study was narrowed down only for two firms.

Future work may be extended to the development of *Blend Model* for game development which combines the Scrum Method as well as the Traditional Method that over comes the blockade of Scrum Challenges.

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