Serious Game Stakeholder Experience Assessment Method (SGSEAM) User Guide

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1. SGSEAM Overview

One of the benefits of using a serious game framework is that, if correctly designed, it will provide useful and reusable "building blocks" with which to develop a variety of serious games. Yet how are we to know if a serious game framework has been "correctly designed"?

Serious Game Stakeholder Experience Assessment Method (SGSEAM) describes a method for assessing serious game frameworks from the stakeholder experience perspectives. The goal of SGSEAM is to identify (a) major strengths of a serious game framework, which aids the community by indicating features of the framework to emulate, and (b) major shortcomings of the framework, which aids the community by indicating features to avoid. The benefits of SGSEAM assessment are for the developers of serious game frameworks to learn and improve from the findings of the assessment.

SGSEAM is an assessment method instead of an evaluation method. The main purpose of an evaluation is to determine the quality of a program by formulating a judgment. An assessment, on the other hand, is nonjudgmental. SGSEAM does not try to judge a framework according to a standard, or to compare one framework against another. Instead, it is used to identify the major strengths and shortcomings of a framework to benefit the developers of the framework.

Figure 1.1 outlines the steps of the process of applying SGSEAM to a framework.

Step 1:

Plan Assessment

- identify stakeholders
- determine approaches
- create schedule

Step 2:

Gather Data

- carry out assessment
- record data
- obtain log data

Step 3:

Produce Report

- analyze data
- interpret strength and weakness
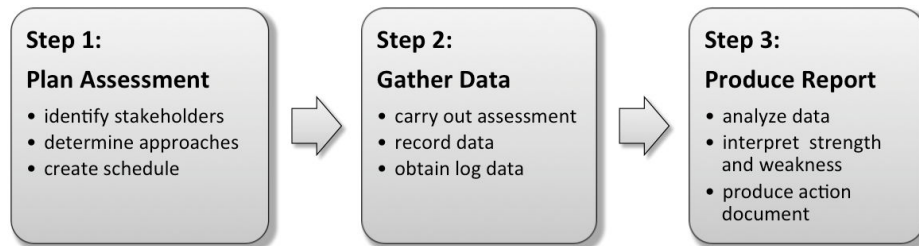- produce action document

Figure 1.1: Applying SGSEAM to a framework

There are three steps in the process of applying SGSEAM. Step one is to plan the assessment, including identifying the stakeholder and participants and creating the assessment plan. The deliverable for this step is the assessment plan document. Step two is to gather data. The deliverable for this step is the assessment data repository. Step three is to produce the strength and weakness report. The deliverable for this step is the action document for framework improvement. The following chapters describe the steps in details.

2. Plan Assessment

2.1 Identify stakeholders

> ✎ Identify the stakeholders in each SGSEAM stakeholder class, write down their names and roles.

SGSEAM assesses the experiences for the stakeholders listed in Table 2.1. For each stakeholder, identify the population, the name and contact if possible. It is important to be able to contact the stakeholders in some way, either via email or phone, to get the feedback from their experiences with the framework.

Stakeholder class	Definition	Examples
Players	participate in the game produced by the framework.	students, residents
System admins	install and maintain the technological game infrastructure.	system admin, IT staffs
Game designer	design the content and game mechanics.	instructional designers, content experts
Game managers	manage the game during the period of game play.	sustainability coordinators, residential staffs
Game developers	develop customization, extend and enhance the game.	programmers, internal developers

Table 2.1: SGSEAM Stakeholders

2.2 Determine assessment approach

> ✎ Determine the appropriate assessment approaches for each stakeholder.

There are usually multiple assessment approaches for each stakeholder. Table 2.2 provides an overview of the assessment method and the approaches. The appropriate assessment approaches should be determined according to the resource available. The approaches for a stakeholder is additive.The more approaches applied, the higher confidence of the assessment can be achieved.

The assessment approaches is categorized into in-vivo and in-vitro assessments. The in-vivo approaches, such as pre-post test, in-game surveys and post-hoc interviews, assess the real world instance of the game. The in-vitro approaches use in-lab experiments in a

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Stakeholder	Assessment Goal	Assessment approaches
Player	How does the framework affect and engage players?	Pre-post effectiveness study(2.2.1.1); Self-reported usability metrics(2.2.1.2); Engagement metrics(2.2.1.3)
System admin	How easy is it to install and maintain the system?	Post-hoc system admin interview(2.2.2.1); In-lab installation study(2.2.2.2)
Game designer	How easy is it to design a game?	Post-hoc designer interview(2.2.3.1); In-lab game design study(2.2.3.2)
Game manager	How easy is it to manage a game?	Post-hoc manager interview(2.2.4.1); In-lab game management study(2.2.4.2)
Game developer	How easy is it to enhance the system?	Post-hoc developer interview(2.2.5.1); In-lab game development study(2.2.5.2)

Table 2.2: SGSEAM approaches

simulated environment. Different assessment approaches will have different levels of rigor or validity. For example, the in-lab experiments (in-vitro) can enlist several subjects to perform the same pre-defined tasks and collect comparable data in a more controlled setting, while in-game surveys or interviews in the in-vivo approach typically collect data from different settings but the data reflect the real world interaction between the stakeholders and the framework.

The following sections describe in detailed the different approaches for each stakeholder. Each assessment approach describes the goal of the assessment, what data to collect, how to collect the data and how to analyze the data to obtain insights about the strengths and weaknesses of the framework from each stakeholder's perspective.

2.2.1 Player assessment

The goal of player assessment is to determine the effectiveness of the game framework from player's perspective. It is essential that a game produced by a serious game framework could achieve its intended "serious" purpose. The intended purposes of serious games are always subject specific. For example, the desired effect of a serious game for energy education and conservation is to increases players' energy literacy and reduces their energy consumption during (and, hopefully, after) the game. A serious game for language learning would have a very different desired effect.

2.2.1.1 Player assessment approach: Pre-Post effectiveness study

This approach requires users of SGSEAM to first determine a set of domain-specific questions to assess the desired effects of their serious game. For example, a set of questionnaires on sustainability literacy, such as knowledge of power and energy, is used to assess the effectiveness of a serious game for sustainability education.

Once the domain-specific questionnaires are determined and designed, present this questionnaires as a survey to a random selection of the players before the game starts. After the game ends, present the same survey to the same players again. Compare the two set of survey response data to study if the game has an impact on the players regarding to the
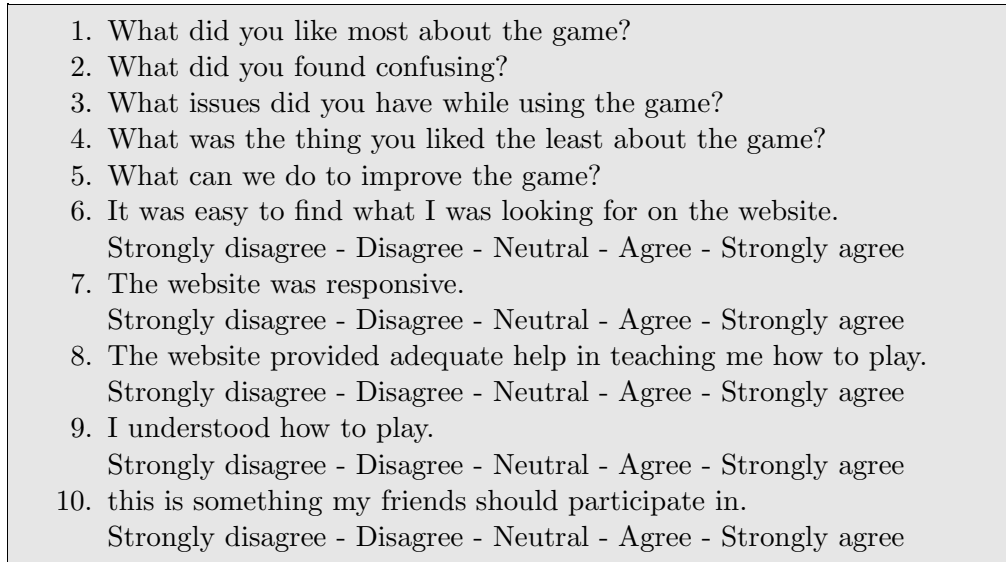
survey subjects. The extent of the changes reflected in the survey result indicates the degree of effectiveness of the serious game for this subject.

Serious games often engage players with resources of various types (energy, water, waste, etc.). Collect these measurements before, during, and after the game in order to acquire evidence regarding the potential impact upon player use of these resources.

2.2.1.2   Player assessment approach: Self-reported usability metrics

This approach interviews players about their self-reported experiences with the game. The interview could be administrated via a face-to-face conversation or through online survey. We found that the online survey is more cost effective than face-to-face conversation. In additions, the online survey could be implemented as an activity inside the game. For example, the Makahiki serious game framework implements a survey activity which incentivizes players to complete the survey by rewarding game points for the activity.

Use the usability questionnaires in Figure 2.1 to interview players:

1. What did you like most about the game?
2. What did you found confusing?
3. What issues did you have while using the game?
4. What was the thing you liked the least about the game?
5. What can we do to improve the game?
6. It was easy to find what I was looking for on the website.
   Strongly disagree - Disagree - Neutral - Agree - Strongly agree
7. The website was responsive.
   Strongly disagree - Disagree - Neutral - Agree - Strongly agree
8. The website provided adequate help in teaching me how to play.
   Strongly disagree - Disagree - Neutral - Agree - Strongly agree
9. I understood how to play.
   Strongly disagree - Disagree - Neutral - Agree - Strongly agree
10. this is something my friends should participate in.
    Strongly disagree - Disagree - Neutral - Agree - Strongly agree

Figure 2.1: Player self-reported usability metrics questionnaires

2.2.1.3   Player assessment approach: Engagement metrics

Player engagement is an important measure for understanding the effectiveness of a serious game. Engagement metrics assess the extent of participation by players and the impact of the game.

Calculate as many as possible the player engagement metrics described in Table 2.3 by analyzing the data from system log or other channels provided by the framework. The more metrics obtained, the better understanding of the extent of player engagement.

With the exception of the game error metric, the higher value these metrics are, the higher engagement level the game has.

Metric	Definition	Mesure
participation	percentage of players who play the game	the level of involvement from players
player	number of players per day	the frequency of players interact with the game
play time	play time of a player per day	the frequency of players interact with the game
submission	submissions of all player per day	the rate of players' completion of game activities
social interaction	social interaction of all player per day	the rate of in-game social interactions between players
game error	game errors per day	the rate of errors encountered by players during the game

Table 2.3: Player engagement metrics

2.2.2 System admin assessment

System administrators are responsible for installing and maintaining the software infrastructure for the game. Their tasks include the framework and dependency installation, maintain the database, backups, and so forth.

2.2.2.1 System admin assessment approach: Post-hoc admin interview

One approach to assess the question of how easy it is to install and maintain the system is a post-hoc interview. The actual system admin(s) are asked about their experience after their installation in the production system. The interview includes the following questions:

1. How much time did you require to install the system and the dependencies?
2. How much time did you require to maintain the system?
3. What problems did you encounter?
4. Did you find it difficult to admin the system? What was difficult?

Figure 2.2: System admin interview questionnaires

After the interview data is acquired, the assessor will perform qualitative data analysis, which involves transcribing (if the interview data is in audio format), categorizing and coding the description of reported problems or difficulties.

2.2.2.2 System admin assessment approach: In-lab installation study

Another approach to assess the question is to use an in-lab experimental study. A group of system admins will be asked to install the system, record the time spent and problem encountered as they complete each step. The qualitative data (i.e., the descriptive problems reported by the participants of the study) will need to be categorized and coded. The

assessor will triangulate the reported time data and the problem categories to identify the area of strength (less time spent) and weakness (problems and difficulties).

The level of confidence of the above two assessment approaches varies. The experimental study approach is more rigor because of the generality achieved from the larger population of participants under study. The data collected during the step by step experimental study is more accurate than the one collected in the post-hoc interview.

2.2.3   Game designer assessment

A game designer uses the serious game framework to design and create a serious game. A serious game framework always provides certain tools or interfaces to game designers with the hope that these will simplify the design of a game. Such tools might involve configuring global settings for the game, such as how long will the game run, who are the players, and how to design individual game elements.

SGSEAM assesses the game designer stakeholder by addressing the following two questions: (a) How much time is required to design an instance of a serious game using the framework? and (b) How many, and how problematic are the errors that designers encounter during the design process?

There are three approaches for game designer assessment:

2.2.3.1   Game designer assessment approach: Post-hoc designer interview

One approach is to interview the actual game designer(s) after they had completed the design in a production system. The following questions will be asked:

> 1. How much time did you spend to complete each design task?
> 2. What problems did you encounter?
> 3. Did you find it difficult to configure? What was difficult?
> 4. Did you find it difficult to design a specific game? Which one, and what was difficult?

Figure 2.3: Game designer interview questionnaires

The interview data will be transcribed (if audio recording), categorized and coded to identify the strengths and weaknesses.

Collect the system log data related to the game designing tasks. When available, the time spent and error encountered can be queried from the system logs. Although these system generated data might be easier to gather in some systems, it might not provide the same depths or insights than the other two approaches where the experiences are provided by the participants directly. On the other hand, these system data can be supplemental to the other approaches. They could be correlated with the data gathered from the other assessment approaches to increase the confident of the assessment.

2.2.3.2   Game designer assessment approach: In-lab game design study

Another approach is an in-lab experimental study, where a goup of participants is asked to use the system to perform a same set of design tasks. The time spent and problems encountered are recorded for each tasks. The assessor will triangulate the reported time data and the problem categories to identify the strengths and weaknesses.

2.2.4   Game manager assessment

A game manager uses the serious game framework to manage the serious game that the game designers created. It is possible that a game manager is also the game designer. Serious game frameworks normally provide certain interfaces for the managers to manage the game. This may involve managing player submissions, monitoring the game state, entering manual resource data, notifying winners of the game, etc.

SGSEAM assesses the game manager stakeholder with the following questions: (a) How much time is required to manage an instance of a serious game using the framework? and (b) How many, and how problematic are the errors that managers encounter during the design process?

Similar to the assessment of game designer experience, SGSEAM proposes three approaches.

2.2.4.1   Game manager assessment approach: Post-hoc manager interview

The post-hoc interview approach gather data from the game manger(s) by asking the following questions:

> 1. How much time did you spend to complete each managing task?
> 2. What problems did you encounter?
> 3. Did you find it difficult to manage? What was difficult?

Figure 2.4: Game manager interview questionnaires

The log data analysis collects system log data related to the game managing tasks. The time spent and error encountered can be deducted from the system log and reveals strengths and weaknesses of the game managing interface.

2.2.4.2   Game manager assessment approach: In-lab game management study

The experimental study approach gather data from a group of participants about the time spent and problems encountered for each task of managing the serious game.

2.2.5   Game developer assessment

The game developer stakeholder is different from the game designer stakeholder, in that the game designer stakeholder tailors the framework without requiring any software develop-

ment, while the game developer stakeholder enhances, corrects, and extends the system by manipulating code.

To investigate how easy it is to understand, extend, and debug a serious game framework from a developer's perspective, SGSEAM assesses how much time it takes to develop an enhancement to the game framework, and how many errors are encountered during the process.

2.2.5.1 Game developer assessment approach: Post-hoc developer interview

This assessment approach is accomplished by interviewing the actual developer(s) to answer the following questions:

1. How much time did you spend developing a customization using the game framework?
2. What problem(s) did you encounter?
3. Did you find it difficult to understand, extend and debug the system? What was difficult?

Figure 2.5: Game developer interview questionnaires

2.2.5.2 Game developer assessment approach: In-lab game development study

The experimental study assessment approach asks a group of developers to develop a same set of enhancements to the system, and ask them to record the time spent to develop and problems encountered during the development.

Similarly, the descriptive data will be categorized and coded. The time data will be correlated to the problem data to identify the areas of strength and weakness.

2.3 Choose participants

Choose participants from each stakeholder class.

2.4 Create assessment schedule

Create a schedule for each assessment, produce the assessment planning document.

3. Gather Data

This step carries out the assessment, record the data, obtain log data, and refine the assessment plan if necessary. The output of this step is a data repository contains all the assessment data that can be analyzed in the next step.

3.1 Carry out the assessment

> Carry out the assessment.

3.2 Record data

> Record the data from the assessment.

3.3 Obtain log data

> Obtain the log data from the framework, including all the interaction log from the each stakeholder.

4. Produce Strength and Weakness report

Analyze the data and produce the action report.

4.1 Analyze data

Analyze the data from the data repository.

4.2 Interpret strength and weakness of framework

Interpret strength and weakness of framework.

4.3 Produce artifact action document

Produce artifact action document.