# SGSEAM Assessment Plan for Makahiki

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## Contents

This document describes the SGSEAM assessment plan for Makahiki. It is the deliverable for the first step of the SGSEAM when applying to Makahiki framework. It first identifies the stakeholders, determines the appropriate assessment approaches according to the available resources, choose assessment participants, and creates the assessment schedule.

# 1 SGSEAM Stakeholders in Makahiki

The first step in SGSEAM assessment method is to identify the stakeholders in Makahiki. Table 1 listed the identified stakeholders who use the Makahiki framework.

| Stakeholder class | Tasks | Role |
|---|---|---|
| Player | Participate in the Makahiki games | Students living in the residential halls |
| System admin | Install Makahiki software, monitor and scale the system, backup, patch maintenance | IT staffs |
| Game designer | Design the content, configure suitable games and mechanics | Challenge organizers |
| Game manager | Manage the game during the period of game play. | Challenge organizers |
| Game developer | Develop customization, extend and enhance the game and framework. | Makahiki developers |

Table 1: SGSEAM Stakeholders

# 2 SGSEAM Approach for Makahiki

The second step in SGSEAM is to determine the assessment approach. As described in SGSEAM, approaches include both *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 simulated environment. Different assessment approaches will have different levels of rigor or validity. When applying SGSEAM in Makahiki, I used the real world Makahiki instances as the in-vivo approaches which includes pre-post effectiveness study for player assessment, post-hoc interview for game administrator and game designer.

In addition to real world instances assessment, I also implemented the in-vitro assessment approach using in-lab experiments. In Spring 2013, Professor Philip Johnson at the Information and Computer Science Department of University of Hawaii used Makahiki to teach a course in serious game development. The students were seniors or graduate students majoring in computer science related fields. During the course, the students installed Makahiki, designed a serious game instance with Makahiki, and developed an enhancement to the Makahiki system. The participation was voluntary. This is considered as an in-lab experiment since they are evaluating Makahiki in a class setting and using Makahiki in the development environments.

Table 2 lists the SGSEAM approaches that are used to assess the strengths and weaknesses of Makahiki from different stakeholders' view.

The following sections describe the assessment approaches in details.

| Stakeholder | Assessment approaches | Expected Outcomes |
|---|---|---|
| Player | Pre-post effectiveness study | Determine effectiveness in energy literacy and resource usage reduction |
| | Self-reported effectiveness survey | Determine self-reported effectiveness in behavior change and awareness |
| | Self-reported usability survey | Identify problem areas in game interface |
| | Engagement metrics | Determine the extent of engagement |
| System admin | Post-hoc admin interview | Determine strengths and weaknesses in system install and maintenance |
| | In-lab system admin study | |
| Game designer | Post-hoc designer interview | Determine strengths and weaknesses in facilitating the game design process |
| | In-lab game design study | |
| Game manager | Post-hoc manager interview | Determine strengths and weaknesses in managing the game |
| Game developer | In-lab game development study | Determine strengths and weaknesses in developing system enhancement |

Table 2: SGSEAM approaches

## 2.1 Player assessment

Real-world Makahiki instances at the University of Hawaii at Manoa were used to study the player's experience with the Makahiki framework. There are over 1000 eligible players for each of these instances. They are first year college students living in four similar structured residence halls in close vicinity. The games lasted for 3 weeks for the year 2011 instance, 9 months for 2012 instance and 2 weeks for 2014 instance.

To assess the effectiveness of the framework for designing games that improve player literacy in sustainability, we conducted two energy literacy surveys, one before the challenge (pre-game) and one after the challenge (post-game). SurveyGizmo is used to create the surveys which consists of the set of sustainability literacy and behavior questionnaires. The response from the two surveys were analyzed to provide insights about the player's literacy and behavior change. The results are described in ?? of the Results chapter.

To assess the effectiveness of the framework for designing games that produce positive change in sustainability behaviors, we recorded and analyzed energy consumption data before, during and after the challenge. Before the challenge, an energy usage baseline was established. The energy consumption data is examined to understand any usage pattern or reduction during and after the challenge. The results are described in ?? of the Results chapter.

We also conducted the in-game self-reported behavior changes survey. The survey asked questions about player interests in sustainability prior to and after the game, as well as any perceived behavior changes when playing the game. The results are described in ?? of the Results chapter.

To assess the usability of the game produced by the Makahiki framework, we conducted an in-game usability survey. The survey asked questions about the players' experience with respect to the user interface of the game. The response from the survey is analyzed to provide insights about the game usability. The results are described in ?? of the Results chapter.

In addition to the surveys and energy data measurement, the following engagement metrics were calculated based on the game and log data to assess the engagement level of the instance:

- Participation rate

- Number of players per day

- Play time per day

- Submissions per day

- Social interactions per day

- Website errors per day

The results are described in **??** of the Results chapter.

## 2.2 System admin assessment

There are two approaches described in SGSEAM to assess the system admin's experience: One is the in-lab experiments, another is the interview of the system admin of a real world instance.

In the in-lab experiments, the students in the ICS691 Spring 2013 class were tasked with installing the Makahiki system into their local computers as well as the cloud environment. In order to understand how much time it takes to install the Makahiki and what problems might be encountered, I designed a Google form which details the steps for installing Makahiki both locally and in the cloud, and for each step, I asked the students to record the time they spent and the problems they encountered.

Figure 1 illustrates a partial google form used for Makahiki system admin assessment. **??** includes the complete google form.

The students were also asked to provide feedback about their installation experiences in the form of a blog post. In the blog post, I asked them to discuss the following topics:

- What is the most difficult step during installation?

- What problems did you encounter during the installation?

- Have you install any database, web server or similar server products prior to this assignment? Are those installations for development or production purpose?

- If you have experience installing other servers before, How does your prior experience of installing other servers compare to the installation of Makahiki?

- What could be improved about the Makahiki installation process?

- Compare your experience of installing Makahiki in Heroku with installing it locally,

The data collected from the Google form response and the blog post from the students was analyzed to gain insights into how easy it is to install Makahiki, and what contributes to the efficiency of the installation. The results are described in **??** of the Results chapter.

In order to gain insights on the experience of a real world system admin who uses the Makahiki, I performed interviews to the system admin of the 2012 Hawaii Pacific University (HPU) challenge. The interview questions include:

- How much time did you spend to install the Makahiki system?

Figure 1: Makahiki Developer assessment Form

- How much time did you spend to maintain the Makahiki system, including backup, monitoring?

- What problems did you encounter during your installation and administering the Makahiki system?

I also collected the email exchanges with the system admin regarding the installation process and maintenance of Makahiki system. Both interview and email exchange data were analyzed to understand the system admin's experiences with Makahiki. The results are described in **??** of the Results chapter.

## 2.3  Game designer assessment

There are also two approaches described in SGSEAM to assess the game designer's experience: One is the in-lab experiments, another is the interview of the game designer of a real world instance.

The students in the in-lab experiments were tasked to design a Kukui Cup-like serious game using Makahiki. I designed another Google form to ask students to follow the designing steps and record their time and problems encountered during their designing process. **??** has the complete Google form for the steps the students need to follow.

The students were asked to provide feedback about their installation experiences in the form of a blog post that discussed the following topics:

- What is the most difficult step during Challenge Design?

- What problems did you encounter while designing the challenge?

- What could be improved in the Makahiki Challenge Design process?

The data collected from the Google form response and the blog post from the students was analyzed. The results are described in **??** of the Results chapter.

I also performed interviews with the real-world game designers of the 2012 Hawaii Pacific University challenge and the 2012 East West Center challenge. I asked them about their game designing experiences using the Makahiki game design admin interface. The interview questions include:

- How much time did you spend to configure the challenge global settings?

- How much time did you spend to design the individual games?

- What problems did you encounter?

- Did you find it difficult to design a specific game? which one, what was difficult?

- What did you like the least when using the system?

The email exchanges with the game designers regarding the game design process were collected. Both the interview and email exchange data were analyzed. The results are described in **??** of the Results chapter.

## 2.4   Game manager assessment

I performed interviews with the game managers of the 2012 Hawaii Pacific University challenge and 2012 East West Center challenge to study the experience of game management using Makahiki. The interview questions include:

- How much time did you spend to approving the action submissions?

- How much time did you spend to monitoring the game status?

- What problems did you encounter?

- Did you find it difficult to manage? what was difficult?

- What did you like the least when using the system?

I analyzed the qualitative data collected from the interviews and email exchanges with the game managers. The results are described in **??** of the Results chapter.

## 2.5 Developer assessment

I performed an in-lab game development study with the students participating in the ICS691 serious game development class. The students in the experiment were tasked with developing an enhancement to the Makahiki instance. This involved setting up the development environment, following the tutorial to create the "Hello world" widget using Makahiki, and finally, developing an enhancement which extends the functionality of the Makahiki system. The enhancement is specified in 5 development tasks.

The students were asked to submit their development source code to the public source code repository (Github) and write a blog post to discuss their efforts to complete the development activity.

I reviewed their source code to compare their code to the reference implementation, analyzed the blog posts from students, as well as email correspondences from students discussing problems during the development.

The students were asked to provide feedback about their development experiences in the form of blog post to discuss the following topics:

- What part is complete?

- What part is not complete?

- Which parts you found easy or hard to complete?

- What problems did you encounter while developing this enhancement tasks?

- What is your recommendations for the framework to improve development supports.

# 3  Assessment Participants

After the assessment approaches are determined, the next step in SGSEAM is to identify the assessment participants for the different stakeholders. Table 3 lists the participants for assessing the Makahiki framework using SGSEAM.

| Stakeholder class | Person(s) | Organization |
|---|---|---|
| Player | All eligible players in the UH KC instance | UHM |
| System admin | ICS691 students, system admin for HPU instance | UHM, HPU |
| Game designer | ICS691 students, game designer for HPU & EWC instance | UHM, HPU, EWC |
| Game manager | ICS691 students, game manager for HPU & EWC instance | UHM, HPU, EWC |
| Game developer | ICS691 students | UHM |

Table 3: SGSEAM Makahiki Participants

# 4 Assessment Schedule

After determining what the assessment approaches and who the participants are, the next step is to create the assessment schedule. The schedule for applying SGSEAM to Makahiki is shown in Table 4.

| Time | Task | Assessment |
|------|------|------------|
| Fall 2011 | Pre-post and in-game surveys, engagement metrics collection with UHM 2011 KC | Player experience |
| 2012 | In-game survey, engagement metrics collection with UHM 2012 KC | Player experience |
| Fall 2012 | Interview with HPU KC sysadmin | System admin experience |
| Fall 2012 | Interview with HPU & EWC KC game designers | Game designer experience |
| Fall 2012 | Interview with HPU & EWC KC game managers | Game manager experience |
| Spring 2013 | In-lab installation experiment with UHM ICS691 students | System admin experience |
| Spring 2013 | In-lab game design experiment with UHM ICS691 students | Game designer experience |
| Spring 2013 | In-lab game development experiment with UHM ICS691 students | Developer experience |
| Spring 2014 | in-game survey with UHM 2014 KC | Player experience |

Table 4: SGSEAM Assessment Schedule for Makahiki