

# SGSEAM Assessment Guide for Lucid BuildingOS and BuildingDashboard

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# 1. Introduction

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This document describes the proposed approach to assess the Lucid BuildingOS and Building-Dashboard using the Serious Game Stakeholder Experience Assessment Method (SGSEAM). The goal of SGSEAM assessment is to identify the major strengths and shortcomings of the framework from the perspectives of user experiences of major stakeholders. The benefits of this assessment are for the developers of the framework to learn from the findings of the assessment and identify any actionable improvements.

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

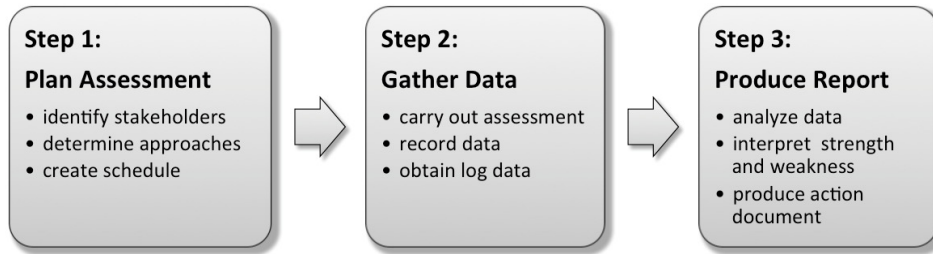


Figure 1.1: Applying SGSEAM to a framework

There are three steps in the process of applying SGSEAM. Step one is to plan the assessment, including identifying the stakeholders, determine assessment approaches, and creating the assessment schedule. The deliverable for this step is the ***assessment plan*** document. Step two is to gather data by carrying out the assessment, record and obtain any related data. The deliverable for this step is the assessment ***data repository***. Step three is to produce the strength and weakness report by analyzing the data and interpreting strengths and weaknesses. The deliverable for this step is the ***improvement action*** document.

The following chapters describe the steps in details.

## 2. Plan Assessment

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### 2.1 Identify Stakeholders



Identify the stakeholders in each SGSEAM stakeholder class, write down their names and contact info.

The first step of SGSEAM assessment is to identify stakeholders of the framework. For Lucid BuildingOS and BuildingDashboard, We will select a few organizations who participated in the Campus Conservation National (CCN) 2014 and used BuildingOS and BuildingDashboard framework to create their competitions. From these organization, we will identify the persons by their stakeholder roles as defined in [Table 2.1](#).

Stakeholder class	Definition	Person(s)
Players	Residents living in the buildings that participate in the competition.	emails
System admins	IT staffs who are responsible for setting up and maintain the software infrastructure for the competition.	name, contact
Game designer	Competition organizers who design and configure the competition such as content experts, designers.	name, contact
Game managers	Competition organizers who is responsible for running the competition such as residential life staff, sustainability coordinator	name, contact
Game developers	Software developers who use the framework to customize, extend and enhance the game.	name, contact

Table 2.1: SGSEAM Stakeholders

For each stakeholder, identify the population, the name and contact info. 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.

## 2.2 Determine Assessment Approach



For each stakeholder, determine the appropriate assessment approaches.

There are several assessment approach for each stakeholders. Different assessment approaches have different levels of rigor which represents confident level of the assessment result. Different approaches also require different levels of implementation costs or efforts. Due to the efforts in recruiting testing subjects and set up the experiments, in-lab experiment assessment may be too expensive in the case of assessing BuildingOS and BuildingDashboard. **Table 2.2** shows the recommended assessment approaches for the stakeholders in BuildingOS and BuildingDashboard. The following sections describes the details for the approaches.

Stakeholder	Assessment approaches	Expected outcomes
Player	Pre-post effectiveness study (2.2.1.1)	Determine effectiveness in resource usage reduction.
	Self-reported usability metrics (2.2.1.2)	identify problem areas in game interface
	Engagement metrics (2.2.1.3)	determine the extent of engagement
System admin	Post-hoc admin interview (2.2.2.1)	identify strengths and weaknesses in the installation and maintenance process.
Game designer	Post-hoc designer interview (2.2.3.1)	Determine strengths and weaknesses in the game design interface.
Game manager	Post-hoc manager interview (2.2.4.1)	Determine strengths and weaknesses in the game managing interface.
Game developer	Post-hoc developer interview (2.2.5.1)	Determine strengths and weaknesses in developing enhancement.

Table 2.2: Lucid SGSEAM Assessment Approaches

### 2.2.1 Player Assessment

The goal of player assessment is to determine the effectiveness of the game framework from player's perspective as well as the usability of the game interface and the engagement level of the game. We proposes three approaches for assessing the player's experience with Lucid's framework.

#### 2.2.1.1 Player Assessment Approach: Pre-post Effectiveness Study

One of the goals of the competition is (but not limited to) the reduction of resource such as energy and water consumption. To assess the effectiveness of this goal, we need to determine the metrics that may be measured before and after the competition (pre-post). Lucid BuildingOS and Dashboard calculates the percentage of reduction of energy and water consumption for each participated building, based on the baseline usage of the previous two weeks. We will use this metrics to measure the effect of the competition. The maximum, minimum and average percentage of reduction of all the buildings are calculated to determine the most, the least and average reduction of the resource usage.

This assessment reveals the extend of effectiveness of the game produced by the framework, regarding to the resource consumption reduction.

### 2.2.1.2 Player Assessment Approach: Self-reported Usability Metrics

We will conduct a player usability survey at the final week or right after the competition to understand the strengths and weaknesses of the game user interface perceived by players. Minimum of 20 players (the more the better) are randomly selected to participate in this survey. The survey is administrated online via survey monkey or other survey tools. We design the survey questionnaire as shown in [Figure 2.1](#).

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

Once the survey is created online, the survey administrator will email the selected players with the link and instruction to the online survey. After we received all the survey responses, we will code and analyze the response to understand the areas of usability problems in the game interface as well as the areas of strengths.

This assessment reveals the strengths and weaknesses of the framework regarding the usability of the game interface.

### 2.2.1.3 Player Assessment Approach: Engagement Metrics

This approach calculates the engagement metrics to assess the extent of engagement from players and the impact of the game. The more engaging the game is, the more potential impact could be to the players.

We will first obtain the detailed logs of user interaction with the game. These logging includes http web server logs and user action logs which identify every user click on the web page. Once the log data are available, we will calculate the engagement metrics as described in [Figure 2.2](#). Calculate as many as possible the player engagement metrics. The more metrics obtained, the better understanding of the extent of player engagement.

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

Figure 2.2: Player engagement metrics

With the exception of the game error metric, the higher value these metrics are, the higher engagement level the game has. Distribution of the above metrics across of the period of the competition also provides insights on the extent of engagement in different time of the competition. For example, it may be typical that the first few days of the competition may have higher number of player and play time metrics because of the launch, or due to the announcement of an interesting real-world event.

This assessment reveals the extent of engagement of the players in the game.

### 2.2.2 System Admin Assessment

The goal of system admin assessment is to determine to what extent the framework facilitates the system administration tasks from system admin's perspective. SGSEAM assesses how much time is required to install and maintain an instance of a serious game using the framework and the problems encountered during the system admin process.

We consider the tasks of system admin interacting with Lucid's framework are:

1. install the software
2. configure smart meter connectivity
3. backup data
4. monitor performance
5. scaling the system
6. patching

We propose the post-hoc system admin interview approach to assess the system admin's experience for Lucid's framework.

#### 2.2.2.1 System Admin Assessment Approach: Post-loc System Admin Interview

Once we identify the contact information of the system admins, the interview will be administrated by using an online questionnaire form followed by an optional phone interview if needed. We design the interview with the following questionnaire that is tailored to the specific tasks of the system admins of Lucid's framework:

1. How much time did you spend to install the system and the dependencies?
2. How much time did you spend to configure the meters?
3. How much time did you spend to maintain the system such as backup, patching, monitoring?
4. Did you need to scale the system? if Yes, how much time did you spend?
5. What problems did you encounter?
6. Did you find it difficult to admin the system? What was difficult?
7. Do you agree for us to call you for a short phone interview if we have more questions regarding your experience with the system?

Figure 2.3: System admin interview questionnaires

Once we receive the responses from the system admin, we will code (categorize) the time and problems encountered to find out what are the problem areas if there is any. if we need further explanation to the response, we will administrate a quick phone interview to address the specific response.

These assessment reveals the strengths, weaknesses and the areas of improvement regarding the system admin process for the framework.

### 2.2.3 Game Designer Assessment

The goal of SGSEAM game designer assessment is to determine the strengths and weaknesses of the framework regarding to the game design process. SGSEAM assesses how much time is required to design an instance of a serious game using the framework and the problems encountered during the design process.

We consider the tasks of game designer interacting with Lucid's framework are:

1. decide competition period
2. set up building occupancy, manual or automated meters
3. decide baseline period
4. monitor competition status during the competition

We propose the post-hoc game designer interview approach to assess the game designer's experience.

#### 2.2.3.1 Game Designer Assessment Approach: Post-hoc Game Designer Interview

The interview is administrated by using an online questionnaire form followed by an optional phone interview if needed. We will interview several game designers of different competitions. The more data we collect, the more insights we get. The interview is designed with the following questionnaire that is tailored to the specific tasks of the game designers of Lucid's framework:

After the interview, code and categorize the reported time and problems to identify the strengths and weaknesses. In addition, if possible, collect the system log data related to the game designing tasks, analyze the logs to find out the time spent and error encountered during the game designing tasks. Use the log data to verify the findings from the interview data.



1. How much time did you spend to set up the buildings including meters?
2. How much time did you spend to setup the competition (competition periods, baseline period, participants)?
3. How much time did you spend to setup the homepage by deciding which widgets to include?
4. How much time did you spend to monitor analytical data to understand the state of the game
5. What problems did you encounter?
6. Did you find it difficult to use the interface? What was difficult?
7. Do you agree for us to call you for a short phone interview if we have more questions regarding your experience with the system?

Figure 2.4: Game designer interview questionnaires

These assessment reveals the strengths, weaknesses and the areas of improvement regarding the game design process for the framework.

### 2.2.4 Game Manager Assessment

The goal of SGSEAM game manager assessment is to determine the strengths and weakness of the framework regarding to the game management process. Similar to the assessment of the game designer, SGSEAM assesses how much time it is required to manage an instance of a serious game using the framework and the problems encountered during the managing process.

We consider the tasks of game manager interacting with Lucid’s framework are:

1. input data manually
2. manage events, marketing, handing out prizes
3. monitor competition status

we propose the post-hoc game manager interview approach for assessing game manager’s experience.

#### 2.2.4.1 Game Manager Assessment Approach: Post-hoc Game Manager Interview

The interview is administrated by using an online questionnaire form followed by an optional phone interview if needed. We will interview several game managers of different competitions. The more data we collect, the more insights we get. The interview is designed with the following questionnaire that is tailored to the specific tasks of the game managers of Lucid’s framework:

After the interview, code and categorize the reported time and problems to identify the strengths and weaknesses in the game managing process. In addition, if possible, collect the system log data related to the game managing tasks, analyze the logs to find out the time spent and error encountered during the game managing tasks. Use the log data to verify the findings from the interview data.

These assessment reveals the strengths, weaknesses and the areas of improvement regarding the game managing process for the framework.

1. How much time did you spend to enter the meter data manually for the baseline period?
2. How much time did you spend to enter the meter data manually for the competition period?
3. What problems did you encounter?
4. How much time did you spend to monitor analytical data to understand the state of the game
5. Did you find it difficult to manage? What was difficult?

Figure 2.5: Game manager interview questionnaires

### 2.2.5 Game Developer Assessment

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 development process.

We consider the tasks of game manager interacting with Lucid's framework are:

1. use API to get data in and/or out of the system
2. customize the interface
3. extend the system to support new meters
4. enhancement

We propose the post-hoc game developer interview approach to assess the game developer's experience.

#### 2.2.5.1 Game Developer Assessment Approach: Post-hoc Game Developer Interview

BuildingOS and Dashboard have APIs for developing apps to tie into the framework. We will use the API to develop an extension or customization of the system. Here are the development tasks we proposed to perform using Lucid's API to extend the framework:

1. create a new widget to be available in the home page.
2. support the automated energy data collection from a new type of meter.

We will ask the identified game developers to perform the above development tasks using Lucid's framework. The developer could be Lucid internal developers or some one outside of Lucid. After the development tasks are completed, we will interview the developers to assess his experience for these development tasks. The interview is designed with the questionnaire outlined in [Figure 2.6](#).

1. How much time did you spend to implement the creation of a new widget?
2. How much time did you spend to implement adding a new type of meter?
3. What problem(s) did you encounter?
4. Did you find it difficult to understand, extend and debug the system? What was difficult?

Figure 2.6: Game developer interview questionnaires

Once the interview data is collected, categorize the reported problems and correlated with the reported time data to identify the areas of strength (less time spent) and weakness (more time spent and problems or difficulties) in the process of development.

These assessment reveals the strengths, weaknesses and the areas of improvement regarding the game development process for the framework.

## 2.3 Create Assessment Plan



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

Once we decide what the assessment approaches and who the participants are, the next step is to create the assessment schedule and produce the assessment plan document. The document should include the detailed assessment plan for each stakeholder class.

Figure 2.7 shows an example of the assessment schedule broken down in the tasks in the plan document.

Game design assessment approach: post-hoc game designer interview		
Task	Estimated Start date	Estimated End date
Design the interview questionnaire		
send out the questionnaires to the game designer(s)		
Collect response data from participants		
Obtain log data		
Analyze the data		
Interpret strength and weakness		
Produce action document		

Figure 2.7: Assessment schedule in the plan document

## 3. Gather Data

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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 Assessment



Carry out the assessment as described in the assessment plan.

For each assessment approach, complete the tasks outlined in the assessment plan, gather the data when carrying out the assessment. Store all the data into a central data repository.

### 3.2 Obtain Log Data



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

Talk to the technical staffs of the framework to find out what kind of log data is available. Obtain the log data in a format that is easy to analyze. For example, if the log data is in a database table, ask for the access to the table, or the CSV export of the table data. If the log data is in a log file, ask for the access to the file. Store the log data into the central data repository.

## 4. Produce Strength and Weakness Report

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This step analyzes all the data gathered from previous steps, interpret the strengths and weakness of the framework, and produce the action report regarding to what areas of the framework needs to improve on.

### 4.1 Analyze Data



Analyze the data from the data repository.

This step performs the data analysis from the data repository obtained from the previous step. Follow the assessment approaches described in [section 2.2](#) for each stakeholder to carry out the data analysis. For example, for player assessment, calculate the engagement metrics from the game log; for game designer assessment, perform queries from user interaction log data to find out the completion time for a certain game designing task such as completing the configuration of global game settings.

### 4.2 Interpret Strength and Weakness



Interpret strengths and weaknesses of framework from the data analysis.

From the data analysis step, identified the problem areas which are indicated by having the most reported problems and the longest completion time.

### 4.3 Produce Reports with Actionable Steps



Produce the action reports for any improvement identified from the strength and weakness analysis.

Once the strength and weakness of the framework are identified from the data analysis, an action report should be produced. This report includes the weakness areas that can be improved and actionable steps on how to improve from each stakeholder's perspective. It also includes the strength areas that the framework needs to maintain.

By producing the report with actionable steps to improve the framework, the SGSEAM assessment is completed.