

SimSE Educational Game E: Estimation with Project Constraints (Version: March 30, 2026)

Audience: Students

Editors:

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1. Introduction/Background

This SimSE game provides a set of scenarios with more non-product attributes of projects more than non-functional requirements (NFR). This simulation module is designed to teach students how to adjust effort estimation ranges when considering the multiple categories of attributes of distinct levels.

2. How to Use This Module

This module is designed to be used as part of a course on software project management and how functional size and other effort drivers can be used in software projects estimation.

SimSE is intended to be used as a *complementary* component to a course, not as a standalone instructional tool.

Therefore, software functional size and software estimation steps and stages with additional effort drivers should be introduced to students either before, or in parallel with the students' exposure to the game (either through lectures (see Section 6), readings (see Section 7), or some other method).

SimSE's main strength lies in its ability to allow students to put concepts into practice that they otherwise would not have the opportunity to experience through other instructional methods.

Before students are given the assignment to play a SimSE game, it is imperative that they watch the SimSE Gameplay video tutorial. It is strongly recommended that they also watch the Explanatory Tool and Game Branching video tutorials as well. All video tutorials are available at <http://www.ics.uci.edu/~emilyo/SimSE/downloads.html#Videos>.

Our experience with SimSE has shown again and again how crucial the instructions a student receives in learning to play the game are to their success in learning from it.

These video tutorials have been designed to specifically highlight and address aspects of SimSE that are critical for students to understand for a maximally effective educational experience. Therefore, we suggest that you not only assign the students to watch these videos on their own time, but, if time and resources allow, show them in class as well, emphasize how important they are to watch, and also point them to the SimSE player's manual, available at:

<http://www.ics.uci.edu/~emilyo/SimSE/downloads.html#Docs>.

If time and resources further warrant, students should be required to attend a teaching-assisted (TA) -lead training session, in which they are shown the videos, given a printed player's manual and, and then allowed to try playing the game for a while with the TA (who should have already studied the manual and played SimSE themselves) available to answer any questions they may have.

Students should be given the questions to answer for this module (see Section 8) at the time they are asked to play the model. Having the questions to refer to while they play helps point them to some of the

more subtle lessons encoded in the model, as well as provides you, as an instructor, with a way to assess whether or not they have completed the assignment and learned the concepts.

One could use this module as a mandatory part of a course, or else make it an extra-credit assignment. 5-10% extra credit is recommended. Certain prerequisites for this particular module apply (see Section 4).

3. Learning Objectives

The learning objectives are from a software management perspective. In this module the learning objectives are:

- **Impact of non-product attributes on estimate intervals:** The total value of non-product attributes determines how the initial estimate shifts to another interval. The final estimate is derived from both the initial estimate and the computed values based on attribute weights and non-product attribute scores. Players must identify how the estimate transitions between intervals according to the criteria provided in the game.
- **Defined evaluation criteria for learning purposes but not always the same in reality:** In this SimSE game, the criteria for evaluating non-product attributes are defined but they are not always as it is in the reality estimation. The goal is to help players produce a way of understanding and consider two different categories of attributes based on some criteria.
- **Flexible sequencing of attribute consideration:** Estimates can be derived by considering different categories of attributes and then combining them into a final estimate. In this game, an initial estimate is provided based on 16 NFRs. This estimate may change depending on the non-product attributes in each scenario. Alternatively, non-product attributes can be evaluated first, followed by incorporating the influence of the 16 NFRs. The sequence of consideration does not affect the final estimate.

4. Prerequisites

A student (e.g., a game player) should have a basic understanding of software engineering and management perspectives. (See Sections 6 and 7 of this document for ways to achieve this.)

For this game, participants must understand how multiple variables (e.g., the set of 16 NFR) may impact software projects efforts.

5. Time Commitment

The average time to play a single game is 10-15 minutes, but, of course, it is likely to take several iterations playing the game for the student to learn the concepts and be able to answer the questions. Participants should be given at least one week of out-of-class time to explore the game and answer the questions (see Section 8).

6. Suggested Supporting Lectures

The book ‘Software Project Estimation’ - by Alain Abran is recommended.

7. Optional Supplementary Readings

1. Navarro, E.O. *“The Fundamental Rules” of Software Engineering*. 2008 [Available from: http://www.ics.uci.edu/~emilyo/SimSE/se_rules.html].

8. Assignment

Instructions

Step 1) Watch the SimSE video tutorials at:

<http://www.ics.uci.edu/~emilyo/SimSE/downloads.html#Videos>.

Step 2) Download the SimSE player’s manual at:

<http://www.ics.uci.edu/~emilyo/SimSE/downloads.html#Docs>.

Note 1: Be sure to watch the video and read the manual carefully, as they will highlight several important things that will significantly help you in successfully playing SimSE and correctly answering the questions.

Step 3) Next, download the Measurement game at:

<https://chairegestionproduitsprojetslogiciels.github.io/simse-software-estimation-capability/games/game-e-effort-drivers-adjustment.html#downloads>.

Note 2: Be sure to download the **game** and not the **model**, as the model is not executable. The download consists of a “readme” text file and an executable game, which you can run by simply double-clicking on it. If you do not have the current version of Java installed on your machine, you will have the opportunity to install it when you try to run a game.

Questions

We recommend choosing approximately three of the following questions to use with this module.

1. Why in the criteria, the maximum value is 20 while the minimum value is -10?
2. When the total value of all non-product attributes is 0, can we imply that all the non-product attributes are nominal?
3. When the initial estimation is greater than +MMRE, and the total value of all non-product attributes is -8, what will be the final estimated decision?

4. The interval shift criteria in this game are predefined. In real projects, criteria are often based on historical data and organizational experience. Could different companies reasonably adopt different shift rules?

5. In this game, an initial estimation based on NFR is provided, and the final estimation is then adjusted based on non-product attributes. Can the order in which these attributes are considered be changed? If so, would changing the sequence affect the final estimation result?

9. How to Use This SimSE Module with Other Modules

This module has been successfully used in conjunction with other effort estimation-related SimSE modules, making an assignment that consists collectively of modules and associated questions.

10. Other Notes

There are several other potentially effective uses for SimSE, most of which have yet to be fully explored:

- Have more advanced students modify an existing model (or build one from scratch, which should only be used with extremely advanced students) using SimSE's Model Builder tool and one of the existing models (available at <http://www.ics.uci.edu/~emilyo/SimSE/downloads.html>).
 - This has been tried, and results published in T. Birkhoelzer, E. Oh Navarro, and A. van der Hoek. *Teaching by Modeling instead of by Models*. Sixth International Workshop on Software Process Simulation and Modeling, May 2005 (available at <http://www.ics.uci.edu/~emilyo/papers/ProSim2005.pdf>).
- Our experience has suggested that an observer presence can have a positive effect on learning in SimSE. Although we have not tried this ourselves in classroom settings (only in controlled experiment settings), some suggested ways to try this are having students play SimSE in pairs or having them play SimSE in a lab setting while observed by an instructor or TA.
- Have students play in teams, especially teams that have also done, or are doing, a class project together. This can add both a collaborative aspect to learning and, if set up to be a competition between teams, can add a competitive aspect.
- Make the assignment mandatory, rather than optional or extra-credit, to increase motivation.
- Have students play in a lab setting, both to add a competitive aspect and to allow them to collaborate.
 - Keep in mind, however, that a lab setting generally does not provide enough time to play a game enough to be able to answer all the questions.
 - An appropriate approach might be to allow students to play the game first in a lab session (this would also allow them to ask any questions that may arise), and then let them complete the rest of their playing and question-answering out of class.
- If a project is also being done as part of the course, have students pick one or more of the SimSE models and write an essay on comparisons between the SimSE process model(s) and the one followed in their project.

11. Feedback?

If you have any comments, suggestions, feedback, or experience regarding this course module or SimSE in general, please send an email to Alain Abran<Alain.Abran@etsmtl.ca>

References

1. COSMIC. (2020). *Early Software Sizing with COSMIC: Practitioners Guide*.
2. COSMIC. (2020). *Early-Sizing-Experts-Guide-May-2020-1*. <https://doi.org/10.13140/RG.2.1.4195.0567>
3. Abran, A. (2015). *Software project estimation: The fundamentals for providing high quality information to decision makers*. John Wiley & Sons.