

Project

1 Overview

The goal of this project is for you to use simulation to improve an existing real-world system for a hypothetical client. For example, your client might be a local coffee shop interested in improving its operations.

As you work on your project, keep in mind the simulation study process flow chart on the last page of this document.

2 Tasks

1. **Preliminary problem description**, due 9 October
2. **Model walk-through**, due on the week 18 November
3. **Presentation**, due on the week of 2 December
4. **Final report**, due on 8 December

You must work in teams of 3 or 4. Detailed requirements for each of these tasks are given below.

2.1 Preliminary problem description

This is a written report. The purpose of this task is for you to start thinking about the real world system that you want to study and how you might improve it. In addition, you will receive some feedback on how to make your project successful: for example, suggestions on narrowing or expanding the scope of your problem, recommendations for other performance measures you might want to consider, ideas on how to collect the necessary data.

In 1-2 pages, your preliminary problem description should address the following questions:

- What is the purpose of your study? What are the objectives that the client wants accomplished?
- How does the system currently operate? Include visual aids (e.g. a flow chart) as appropriate.
- What aspects of the system will you include or exclude from your model?
- What performance measures will you use your model to compute? How will these performance measures help the client obtain his or her objectives?
- What data will you need? How will you collect it?

2.2 Model walk-through

This is an oral presentation by your group, just to me. The purpose of this task is for you to get some interim feedback on your modeling, programming, and analysis. At the time of your model walk-through, you should at least have a working SimPy model, and a detailed plan for your input data analysis, output data analysis, and verification.

In about 15 minutes, your model walk-through should address the following questions:

- (As a reminder) What is the problem you are studying? How does the system operate? A flow chart would be very useful here.
- What are the parameters, processes, resources, levels, and stores in your model?
- What monitors have you set up? How will you use these monitors to compute the performance measures you want to study?
- How did you validate your model?
- What input data analysis have you done, or are planning to do? Explain the reasons you made certain assumptions, which statistical tests you performed, and where the results of your input data analysis are used in the simulation model.
- What output data analysis have you done, or are planning to do? Explain which statistical tests you performed or will perform, and how their results will inform your conclusions.
- What have you done, or are planning to do, to verify that your simulation model is working properly?

2.3 Presentation

This is an oral presentation by your group, to the entire class. The purpose of this task is to share your work with your classmates, and get some practice and feedback on giving a non-technical talk about technical work. As a quantitative analyst, you will often have to sell your results to an audience that does not have the same technical background as you do.

In about 15 minutes, your group should summarize the findings of your study by addressing the following questions in a non-technical fashion:

- What was the purpose of your study? What were the goals that the clients wanted to accomplish?
- How does the system currently operate? What modifications did you propose?
- Based on your input data analysis, what assumptions did you make when you modeled the system? Why are these assumptions reasonable?
- How did you validate your simulation model? What are the limitations of your simulation model?
- What experiments did you perform? What performance measures did you compute? Based on your output data analysis, what were the results of your experiments? Using tables, diagrams, and graphs is important here.
- What are your conclusions and recommendations, based on your simulation study?

2.4 Final report

This is a written report. The purpose of this task is to create a well-written summary of all the work you have done on this project, and for you to get some practice with technical writing. Write your report in the past tense: it is a report of a completed project.

In your report, you should address the following questions:

- What was the purpose of your study? What were the goals that the clients wanted to accomplish?

- How does the system currently operate? What modifications did you propose?
- Based on your input data analysis, what assumptions did you make when you modeled the system? Why are these assumptions reasonable?
- How did you validate your simulation model? What are the limitations of your simulation model?
- What experiments did you perform? What performance measures did you compute? Based on your output data analysis, what were the results of your experiments?
- What are your conclusions and recommendations, based on your simulation study?

In addition to your final report, you must submit an electronic appendix (one or several IPython Notebooks) containing code for your simulation model, input data analysis, and output data analysis.

3 Guidelines and suggestions

3.1 Written reports

- Focus on making your reports well-written, organized, and concise.
- Use graphs, tables and diagrams where appropriate. Visual aids enhance a report and are usually more easily understood than a table of values. Diagrams should be done with a computer.
- Proofread, proofread, proofread.

3.2 Oral presentations

- Practice, practice, practice. Delivery is important.
- Each team member must give part of the briefing and be conversant on the whole presentation. For the presentation to the class, the entire team must be at the front of the room during the entire report.
- Prepare slides using presentation software.
 - List bullets and talk about them.
 - Use diagrams and graphs to visually present results.
 - Do not put too much on one slide.
 - Avoid the temptation to show detailed mathematics or code.
 - Choose your slides carefully. Usually the audience receives a copy of them and this is the only written record they have of your talk. The slides should contain the key points of your project.
- Talk to the audience, not to the screen.
- Be enthusiastic and proud of your work. Sell your results.
- You will entertain questions at the conclusion of your remarks. Be prepared. If you are unable to answer a question, do not bluff an answer. Offer to look into the question.

The Simulation Study Process

