

**Use of ExtendSim in an Service Operations Management Course at the William E
Simon Graduate School of Business Administration.**

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I would like to report on my use of the simulation package in my MBA course: OMG 412: Service Operations Management in the Fall 2010. This is a second year elective course taken by about 20 students.

The simulation package was a central part of the course. I attach a syllabus of the class which shows sequence to topics taught, and specifically how I used ExtendSim.

The software fit quite well into the topic of the course which was managing service systems. In terms of applications, the package was used by students to model various service operations. Many of the cases were based upon Harvard Business School cases (BAT, Benihana, CVS).

A car wash (an exercise from ExtendSim examples)
Police dispatching policies for patrol cars
Managing a technical call center and priority rules (BAT case)
Capacity analysis of a restaurant (Benihana of Tokyo)
Process improvement of a retail drug store (CVS case)

What is most enlightening is the list of homework assignments related to ExtendSim

Training materials:

I was greatly aided by Robin Clark who shared power point slides which provided a quick and useful introduction to using ExtendSim. He also was very helpful to me in learning some of the more obscure features of the package.

I helped my students learn ExtendSim by making a series of video tutorials which I posted on the class website. The tutorials were each about 10-20 minutes long and focused on an increasingly complex set of modeling skills. In all I made 6 tutorials. The students really liked "seeing how it was done" I made sure to pace them slowly enough so that the features of ExtendSim could be absorbed. I used the Macintosh software called "Screenflow" to capture the ExtendSim screen and provided verbal narration.

Week		Topic of class	HW due for this session-for details look at the weekly assignment sheet. (Please follow the up-to-date weekly assignment sheet as the precise assignment.)
1	September 20 Monday 5:30-6:50	Intro to course and service strategy	
2	September 27 Monday	Process mapping, removing variability in service delivery Introduction to ExtendSim modeling	Shouldice Hospital Ltd. case and questions. Readings on service strategy
3	October 4 Monday	Extend software Managing the backroom	ExtendSim Tutorial
4	October 11 Monday	Managing the front room	BAT case and readings on managing the back room
5	October 18 Monday	Yum case Process Improvement	Yum case and readings on managing the front room
6	October 25 Monday	Quiz 1 Benihana	Benihana case and readings on linear programming
7	November 1	Introduction to revenue management ING Direct	ING case Exercises in linear programming
8	November 8 Monday	Blue Sky	Blue Sky A,B,C cases
9	November 15 Monday	Revenue Management II	
10	11/22 Monday 5:30-6:50	Transportation National Group	
11	11/29 Monday 5:30-6:50	Service Failures and recovery	Northwest Air case
12	12/1 Wednesday 5:30-6:50	Wrap up	Project presentations

OMG 412
Service Operations Management
Homework for Week 3: Due Monday October 4, 2010

1. **Skim: Basic Training for ExtendSim slide set**
2. **Watch: Video tutorials on ExtendSim**—found on Blackboard. (There will be 3 or 4 of them by this Wednesday pm).
3. **Read and prepare simulation for: Discrete Event Modeling Tutorial.** This tutorial develops a model for a car wash. Features added to this model include: drawing plots, adding a parallel server, adding workers who are needed to clean the cars, setting item attributes, introducing random arrivals for customers who desire different services, routing these services to different servers. **Create this simulation and run it.**

Use what you have learned to: propose a service system with arrivals of different types of customers who must be served by different servers. Describe a resource that the servers need, but there is only one unit available. Plot the waiting times for the different customers. Create a 95% confidence interval for the wait times. **Hand in this model via email before class time. You can make this problem as difficult or easy as you wish. However, to reduce headaches start easy and then make it more complex. You may do this by team. By all means help each other!**

OMG 412
Service Operations Management
Homework for Week 4:

OMG 412

Service Operations Management

Professor Phil Lederer

Homework for week 4: Due Monday October 11, 2010

1. Preparation for The BAT Case: Putting Tech Support on the Fast Track

Read the case and answer the following questions. On the class's Blackboard site is the Extend file *BATcurrent.mox*, which models the current BOP! Team 1. Make sure that you understand the model, and then modify the model to answer these questions.

You will find some hints and tips on a document found with the mox file.

1. Given the current arrival rate of 22.5 customers/hour, how many technicians are needed to offer a one minute average wait for all customers? What is the utilization of the system? How do these two values (the # technicians needed and the utilization) change if the arrival rate increases or decreases by 25%?
2. Suppose Grayson implements Fast Track by keeping BOP! Team 1 together as one team with 8 servers, and giving priority to Fast Track calls. Assume that the arrival rate is 22.5/hour and 30% of customers choose to be Fast Track. What is the average wait for

Fast Track calls? For standard calls?

3. Given the arrival assumptions in Question 2, what staffing level is needed to deliver an average one-minute Fast Track wait? Given your answer, is Fast Track economically viable? Does your answer change if the percentage of Fast Track customers changes from 30%?

4. How would your answer to question 3 change if BAT provides free service to all Fast Track callers who have a wait over one minute?

5. Should BAT offer service contracts or pay-per-call service?

6. Would you implement Fast Track? Explain why or why not.

Comments on *BATcurrent.mox*:

¥ The λ block converts the arrival rate into an interarrival time (for example, with an arrival rate of 22.5/hour, there is an arrival every $60/22.5 = 2.67$ minutes).

¥ In the block labeled "Customer Service," the parameter on the "Process" tab labeled "maximum items in activity" is the number of technicians.

¥ After the model is run, double-click on the Mean & Variance block labeled "Summary Stats" to see the Mean waiting time, averaged over 50,000 minutes of operation. Note that this mean will change each time you run the simulation (queueing systems can have

OMG 412
Service Operations Management
Homework for Week 5:
 OMG 412

Service Operations Management

Professor Phil Lederer

Homework for week 5: Due Monday October 18, 2010

3. Add the feature of Batching and Unbatching into your ExtendSim model. I will post a video on how to do this by Thursday this week. So we have a chance to discuss these features, in class, you may wait until the 24th to submit the revised model.

OMG 412
Service Operations Management
Homework for Week 6:
 OMG 412

Service Operations Management

Professor Phil Lederer

Homework for week 6: Due Tuesday October 26, 2010

I have decided to give you a take home midterm quiz which will be due on Tuesday 26th at 5:50 at my office: CS 3306B.

We will not have a regular class meeting on Monday night. Instead, on that day, I will be in our classroom from 6:50-8:30pm to give any interested student help with ExtendSim. I also will be available on weekdays and also on Sunday, 24 October by appointment.

As we are not having a full class meeting, I want to make up some lost class time. I will do this by meeting on 22 November, 2010 for a full period. You may recall that day is one of the sessions we are scheduled for 80 minutes. Please check you calendars for conflicts with this date.

The midterm will be based upon the case: Pharmacy Service Improvement at CVS (A), which is attached.

This case studies the operation of the pharmacy function at CVS drugstores. In particular, it discusses the order-fill process for the pharmacy. The operation is not working very well. What I would like you to do is:

1. Conduct a strategic service vision for CVS Pharmacy (the whole retail store, not just the pharmacy). Use this analysis to explain what operation improvements are key.
2. Draw a process flow diagram for the current drug dispensing process.
3. Indicate what problems are now occurring, why they are occurring and how serious they are.
4. Propose an alternative process along the lines of your ideas in (1) to accomplish that.

You may make simplifying assumptions about items (2), (3) and (4). Clearly there are some issues for which you have little or no information. Just make your assumptions clear.

But I expect details which are well described in the case to be captured.

5. Build an ExtendSim model that models the process in (4) as closely as you can. Try to use only the simulation features we have discussed in class so far. Thus simplification will probably be necessary. But many features can be captured, such as time-dependent order arrivals, customers who wait for their orders, errors caught, etc. You may omit details in (4) that are too complex to model. That too is ok (so long as it is clear that simplifications are necessary.)
6. Use the model in (5) to report performance of the system by key measures.

Again, I will be available for coaching on ExtendSim. If you are stuck, give me a call.

OMG 412
Service Operations Management
Homework for Week 7
 Homework for week 7

Due November 1, 2010

Read the case *Benihana of Tokyo*. Supplemental case information: Benihana generally “batches” customers in groups of 8 when going from the bar to the dining area. In other words, if you arrive in a party of 2, you will wait in the bar until you can be seated alongside 6 strangers at a table for 8.

1. How successful is Benihana? The first West Side Benihana reportedly paid for itself in 6 months. A more typical Benihana might be its Chicago unit. Using the data in the case, compare Benihana’s profitability to that of a typical restaurant by filling out the following table (all percentages relative to gross sales unless indicated otherwise):

Item	Typical restaurant (%)	Typical Benihana (%)	Typical Benihana (\$)
Food sales	70-80%		
Beverage sales	20-30%		
<i>Gross Sales</i> =	100%	100%	1,300,000
Food cost (% of food sales)	38-48%		
Bev cost(% of bev sales)	25-30%		
<i>Gross profit</i> =	55-65%		
Labor and benefits	35-40%		
Advertising	.75-2%		
Rent	4.5%-9%		
Other (supplies, utilities, admin, maint., insurance, royalties)	10-20%		
<i>Pretax profit</i> =	3-14%		

2. Construct a process flow for Benihana. Compare and contrast this process flow with that of a typical restaurant.
3. What does Benihana do to reduce the dining time of its patrons? What does Benihana do to control variability?
4. How big of a factor are the bar and the batching of customers to Benihana’s profitability? I have provided a ExtendSim simulation of Benihana called: Benihana.mox simulation that can be found Blackboard. Run the simulation multiple times under the following three scenarios: (1) as a “typical old-fashioned restaurant” – that is, a restaurant without a bar that doesn’t batch customers; (2) as a “typical modern restaurant” – that is, one with a bar that doesn’t batch customers; and (3) as Benihana runs their restaurants, with a bar and batching. Using your results, calculate how much the bar adds to the restaurant’s profitability. Also calculate how much batching of customers adds. (Run all the simulations with 14 tables in the restaurant.)

This is a rather sophisticated “mox” model. We can talk about some of the details during the

class

5. Is Benihana constrained by its capacity? Compare Benihana's demand (as found in the simulation) with its capacity. Comment on Benihana's utilization as compared to a typical restaurant with a similar size and demand.