

Simio Academic Case Studies

Simio Fresh Mex

Spring 2024

A. Introduction

You have been hired as a consultant by Simio Fresh Mex, a made-to-order Mexican food restaurant, where your task is to help the general manager improve the restaurant's operations. The general manager is experienced in the food industry but has no technical or modeling background and wishes to improve Simio Fresh Mex customer service as they have been struggling to figure out operational and staffing rules.

Simio Fresh Mex handles both in-person and online orders and makes all the menu items that comprise orders on a five-station prep line. The assignment is to develop one or more Simio models of the restaurant operation and use the models to help determine the staffing, task allocation, and other operational parameters to optimize the system based on resource requirements and customer service. We provide some historical data for you to use during model development and experimentation.

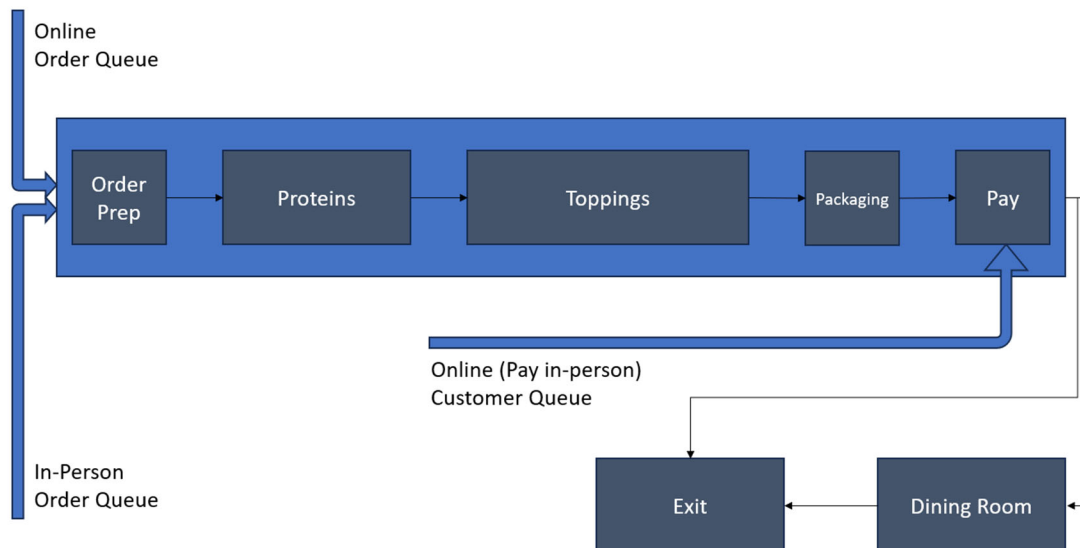


B. System Description

Customers can come to the restaurant and order in-person or order online for later pickup. As shown below, there are 5 stations: Order Prep, Proteins, Toppings, Packaging, and Pay and every order will go through these stations in sequence. These 5 stations require a worker for tasks to be completed, with logic that will be described later. Like other made-to-order Mexican restaurants, at the Order Prep station, customers will decide between a burrito, bowl, salad, or tacos. The customer then chooses white or brown rice, black or refried beans, as well as pork, chicken, beef, or tofu at the Proteins station. At the Toppings station, the customer chooses which toppings they want such as guacamole, cheese, sour cream, lettuce, hot salsa, mild salsa, queso, etc. Then the customer moves to the packaging station where their order is wrapped up before moving to the Pay station where they pay for their order. As the customer must make all these decisions in the line – sometimes discussing the options with the worker, the in-person orders can take more time for the individual tasks than the online orders since they arrive with all options pre-specified, and no discussion is required.

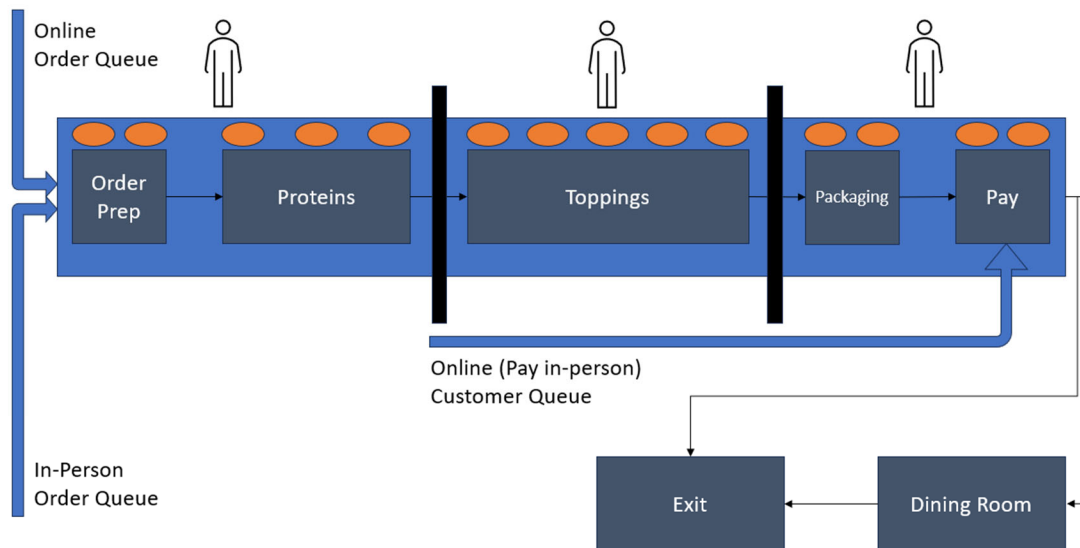
The online orders have an attached “promised time” that specifies when the orders are to be completed. Online orders will arrive and wait in the queue until the worker at Order Prep starts the prep process. The order items then follow the same 5-step sequence as in-person orders. Currently workers try to start an online order from the queue when it is within 10 minutes of its promised time. Customers who order online have the option to pre-pay when they place the order or pay in the restaurant when they pick it up. If they choose to pay in the restaurant, when they arrive, they will go directly to the Pay station to pay and collect their order (see the diagram below). The manager would like some guidance on how the staff member responsible for the pay station should prioritize between the in-person orders coming from the Packaging station and the online customers waiting to pay (in a separate line). Online customers that pre-pay will be able to pick up their orders from a rack by the door and don’t require any interaction with staff. The general manager has noticed that some potential in-person customers will show up to the restaurant and see the long line and leave before entering. The minimum number of orders ahead in line for a potential in-person customer to leave is 30, they are most likely to leave at 35. The longest the line will get is 40 orders in line.

The restaurant is open from 10 am to 10 pm every day. The historical data includes 30 days of orders (in-person and online) and will help you determine the hourly arrival rates, order type proportions, and task times. Below is a diagram of the layout of the restaurant and the flows within.



It’s important to understand the operational model that Simio Fresh Mex uses. Workers can be assigned to multiple stations, but the assigned stations must be “in sequence” and workers don’t cross each other when moving between their assigned stations. Below is an example of work allocation with 3 staff members. For each staff member, there is one fewer “line” drawn between stations. With 1 worker there are no lines, with 2 workers there is 1 line, etc. There is a maximum of 5 workers in the system, up to 1 per station. The workers will remain at the stations to which they are assigned but have free movement

within their assigned section. The worker will currently follow an order from the start to the end of their section before moving the order to the next section and starting a new order. The manager would like guidance on whether this strategy of following an order through each section is the best method going forward. Assume an approximate 5 second travel time for staff members moving between adjacent stations. Due to Health Department rules, gloves must be worn when handling food and cannot be worn when using the register. Because of this, workers transitioning to or from Pay to any other station must remove or put on gloves, taking approximately 30 seconds. Each of the orange ovals in the diagram represents a space available for an order.



C. System Details

The cost for each worker-hour is \$30 and the average order costs \$12 to the customer, with an expected profit of \$7 per order.

The data file contains information on all the orders that have come in over a 30-day period. The data is comprised of the following columns shown below. All the times are reported in seconds, except for the Dining Room Time which is in minutes. Note that when an online order is pre-paid, the Pay Time is shown as 0.0. Also note that when a customer takes their order to go, the Dining room Time is shown as 0.00.

Column	Description
ArrivalDate	Date and time of customer arrival to the restaurant
OrderPrepTime	Time in seconds that the order is processed in the Order Prep station
ProteinsTime	Time in seconds that the order is processed in the Proteins station
ToppingsTime	Time in seconds that the order is processed in the Toppings station

PackagingTime	Time in seconds that the order is processed in the Packaging station
PayTime	Time in seconds that the order is processed in the Pay station
DiningRoomTime	Time in minutes that the customer spends in the Dining Room
OrderType	Menu item associated with the order (Burrito, Bowl, Tacos, or Salad)
OrderModality	Denotes whether the order was placed in-person or online
PromiseTime	Date and time an online order is promised to be finished by

	A	B	C	D	E	F	G	H	I	J
1	ArrivalDate	OrderPrepTime	ProteinsTime	ToppingsTime	PackagingTime	PayTime	DiningRoomTime	OrderType	OrderModality	PromiseTime
2	12/7/2023 10:05	16.5	12.3	15.3	27.2	0.0	0.00	Burrito	Online	12/7/2023 10:20
3	12/7/2023 10:08	15.6	13.1	15.1	34.3	0.0	0.00	Tacos	Online	12/7/2023 10:23
4	12/7/2023 10:10	23.0	13.1	8.5	29.9	0.0	0.00	Tacos	Online	12/7/2023 10:25
5	12/7/2023 10:09	32.4	19.8	39.4	38.6	58.1	0.00	Bowl	InPerson	
6	12/7/2023 10:22	41.3	23.0	23.1	23.6	64.4	14.80	Bowl	InPerson	

D. Summary

To summarize, the core assignment is to develop one or more Simio models of the restaurant and use those models to help determine the hourly staffing requirements (numbers of workers and task allocations) and operational strategies (task priorities, customer priorities, buffer sizes, dining room capacity, etc.) to fulfill Simio Fresh Mex's operational goals.

The primary objective is to minimize labor costs subject to an approximate 90% service level constraint of 15 minutes from arrival to finished payment at any given hour of the day. In addition, the general manager would like to have your advice on operational and staff training strategies based on your model and experimental results.

E. Hints/Suggestions

- Consider the use of referenced properties for buffer sizes and more – this will significantly simplify experimentation.
- Consider using Related Data Tables and/or Task Sequences to accommodate different processing times for different order modalities. See the Simio Help in the Support ribbon for details and examples.

F. Challenge Questions

- Is there a better method to complete online orders? Would a second line dedicated to online orders be worth the extra cost of the line and additional workers? Would an extra staff member dedicated to online orders using the existing line increase efficiency or would they get in the way of productivity?
- The general manager is thinking about creating a promotion that would incentivize online customers to pay online. If 90% of online customers pay for their order online, how will this affect the system? Would it change any staffing recommendations that you have made?
- How would throughput change if Simio Fresh Mex was able to conduct a Kaizen event that would yield less variability at each station? This improvement would come at a cost of x, would it be worth it over a 6-month time horizon?