Bottlenecks and perceptions

Class handout

[*As class starts, Radu passes out a handout with the following case and asks the students to read it out loud as a group, each taking turns to read. Radu gives students some time to ponder and discuss among themselves in smaller groups.*]

Case: The Lunch Line at Suzu's

Mei Tanaka had run Suzu's, a ramen counter near the financial district, for six years. The restaurant was open only for lunch, Monday through Friday, 11:30 a.m. to 2:00 p.m. Long lines at Suzu's were legendary, and started forming even before the counter opened.

The broth at Suzu's simmered overnight and was never reheated from a previous batch; the noodles were made fresh each morning and added to the bowl at the last moment. Mei described the ramen as "best in the first five minutes". After that, the noodles began to soften and the broth lost its heat. Suzu's had never offered takeout, serving its noodles in ceramic bowls that were not allowed out of the restaurant.

The restaurant's layout was simple. Thirteen stools lined a long counter that wrapped around the open kitchen. When diners entered, they waited in a line to order at one end of the counter. There is a kiosk machine at the entrance where customers chose the ramen and placed their order. After ordering, customers waited to receive their noodles and then took the next available stool. Parties of two or more were asked to split up and take whatever stools were available. A stool was almost always free by the time the next customer got their bowl in hand, a fact that surprised many first-time visitors, given the length of the line outside. From the moment a customer sat down to the moment they paid and left, a stool was occupied for about 12.5 minutes on average.

The kitchen was staffed by two chefs during the lunch rush, working side by side at the same station; each chef could fully assemble one bowl: ladling broth, blanching noodles, and arranging toppings in about 2 minutes.

Last month, a representative from CitySpoon, a delivery platform, asked to meet with Mei. CitySpoon estimated it could generate an additional 24 to 30 bowl orders per hour, delivered by CitySpoon's couriers within a promised fifteen-minute radius.

Mei was intrigued by the additional revenue, but had concerns. The first was the ramen itself—whether a fifteen-minute delivery window was compatible with a dish she had spent six years insisting must be eaten within five. The second was harder to articulate. Something about the idea made her nervous it would impact her dine-in customers too much.

Question for consideration:

> *What is the bottleneck of Mei's business? Should Mei sign on with CitySpoon? What should guide her decision?*

Class discussion

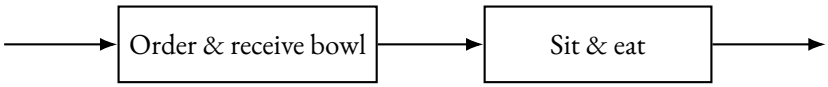
RADU: Before we do any analysis at all, I want a quick show of hands. If you were Mei, would you sign on with CitySpoon?

[*Three-fifths of the class raise their hands in favor.*]

Good. A real split. Let's remember that and dive in. [*Turns to the board.*] Let's start by understanding Suzu's current operation, before we think about what it could become. Binesi, what should I draw for the process flow for the dine-in experience?

BINESI: A customer arrives, they order and receive their bowl, they find a seat and eat, and then they leave.

[*Radu draws on the board as Binesi speaks.*]



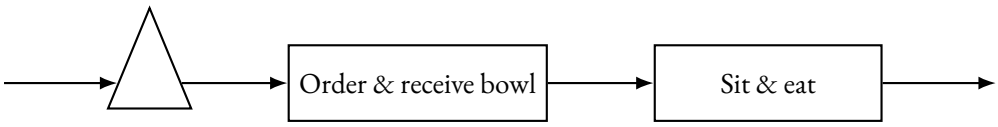
RADU: I feel something is missing, don't you?

BINESI: [*Pauses.*] Yes, the wait. There is always a line outside.

RADU: Right. Where does it go?

BINESI: Before the ordering step, since that is what they are waiting to do.

[*Radu updates the figure.*]



RADU: Good. Now, what are the resources here?

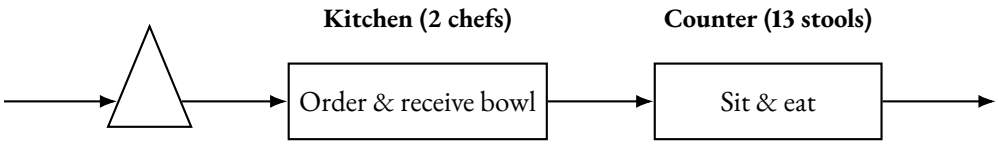
HAOYU: The chefs are the resource behind the "order and receive bowl" step. They assemble everything: broth, noodles, toppings.

RADU: And the "sit and eat" step?

[*A long pause*]

FARAH: The stools, I suppose. The stools are what make it possible to eat inside.

RADU: Good. Let me label those on the figure. [*Annotates the diagram.*]



RADU: Is everyone happy with this picture?

BINESI: Isn't it a little strange that the stools are the resource for the second activity? Stools don't eat.

RADU: And that concerns you?

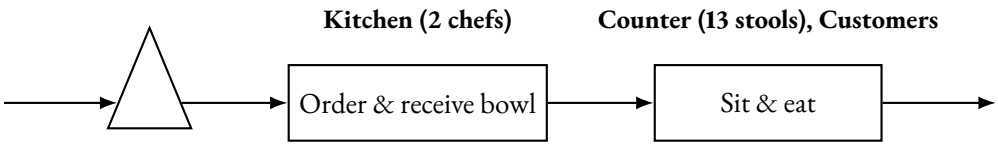
BINESI: We are making a mistake we have made already several times in previous classes, we are forgetting the role of the customers as a resource here! I would have thought customers themselves were the key resource for "Sit & Eat".

RADU: Farah, you agree?

FARAH: Yes, of course. Leave it to me to forget the people involved ... again.

RADU: And leave it to Binesi to remember them.

[*Adjusts the figure.*]



RADU: Let's stick with this picture for the moment. Are we able to sort out what is the bottleneck resource?

HAOYU: [*Quickly.*] I would guess it's the customers at the stools. The restaurant only has thirteen stools; that is quite limiting.

RADU: That is a perfectly reasonable guess. Did you compute something to come up with that?

HAOYU: No not really. It is just experience. When you go to a restaurant, you are always waiting for a seat. At my restaurant, it was always the seats.

RADU: Indeed, indeed. Is everyone convinced by this logic? The stools are the bottleneck?

[*A couple of students nod, others are noncommital.*]

RADU: Does it bother you Haoyu, that everyone is lined up in front of the chefs? Doesn't that hint to you that the chefs are the bottleneck? Everyone is waiting for them, no?

HAOYU: Good point ...[*Looks into the air puzzled.*]

MING: Just because they are lined up in front of the chefs doesn't mean they are the bottleneck, there is just nowhere else for them to wait. [*Haoyu nods in enthusiastic approval.*]

RADU: Is that the case? There is nowhere else to wait?

[*There is silence for about 10 seconds, as Radu paces around looking confused, staring at the board, and seemingly starting to speak, and then choosing not to, only to pace once more.*]

CAMILA: There is something that bothers me about our process flow diagram.

RADU: Me too. What bothers you?

CAMILA: Why isn't there a triangle in front of "Sit and Eat"?

RADU: Indeed, good question. Binesi, what was your thinking to not put one there?

BINESI: [*Pauses in thought*] Hmmm, yeah, did I overlook something? The case does not mention waiting inside of the restaurant after the chefs. I was just thinking the line is physically in front of the chefs, so I suggested drawing it there, but I didn't think that people might be in that line but actually waiting for a *seat* instead of a *chef*. Is that possible?

[*A brief pause.*]

FARAH: No, no, no. There's an important detail in the case. It says that every customer has a place to sit when they get their noodles. This suggests that there is no waiting before the "Sit and Eat" activity.

HAOYU: This part of the case confused me. There is never anyone waiting around with noodles in hand, looking for a seat? Sounds a little like marketing to me. How can that be possible?

RADU: It is surprising, as the case says. How can we make sense of this strange fact?

CAMILA: Well, it seems to me that the chairs are *not* the bottleneck. If they were the bottleneck, people would be waiting for a seat.

HAOYU: But people are waiting for stools; there's a huge line!

CAMILA: There's a huge line in front of the *chefs*, not the *stools*!

HAOYU: What's the difference!?

CAMILA: It makes all the difference!

[*Both Haoyu and Camila are looking quite animated by now, almost ready to get out of their stools.*]

RADU: Okay, okay settle down, settle down. This is just an MBA class discussion, nothing to get riled about. [*Pauses for a moment for the air to cool in the classroom.*] By show of hands, who thinks the chefs are the bottleneck?

[*Camila and Farah raise their hands.*]

And who thinks the chairs are the bottleneck?

[*Ming and Haoyu raise their hands.*]

Binesi, I notice you didn't raise your hand. What happened?

BINESI: Can't both of them be a bottleneck?

RADU: How so?

BINESI: If both of them have the same capacity, they would both be bottlenecks, no?

RADU: That is true, that is true. I think I said so in an email after the pizza class.

BINESI: That is what I thought.

RADU: It's a nice thought indeed. [*Pauses.*] Well, we are quite split, aren't we? Might this be a time to compute something to resolve this?

FARAH: Finally, I thought you'd never ask.

RADU: Then go ahead.

FARAH: Starting with the kitchen. Each chef takes two minutes per bowl, so each produces $60/2 = 30$ bowls per hour, and together they produce $2 \times 30 = 60$ customers per hour.

RADU: Bowls or customers?

FARAH: Same thing here. Parties split up, so every customer gets one bowl.

RADU: Right, exactly.

[*Radu writes on the board expressing what Farah earlier said in words.*]

$$\boxed{C_{\text{kitchen}} = 2 \times \frac{1 \text{ customer}}{2 \cancel{\text{ minutes}}} \times \frac{60 \cancel{\text{ minutes}}}{\text{hour}} = 60 \text{ customers per hour.}}$$

And the stools?

FARAH: Each stool is occupied for 12.5 minutes on average. So each stool turns $60/12.5 = 4.8$ times per hour. There are 13 stools, so we multiply to get 62.4 customers per hour.

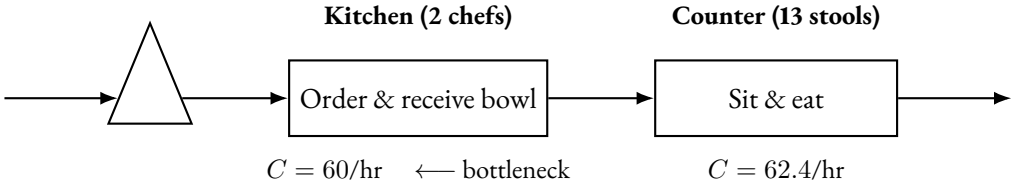
RADU: Like this? [*Draws on the board.*]

$$C_{\text{counter}} = 13 \times \frac{1 \text{ customer}}{12.5 \cancel{\text{minutes}}} \times \frac{60 \cancel{\text{minutes}}}{1 \text{ hour}} = 62.4 \text{ customers per hour.}$$

FARAH: Correct.

MING: [*Slowly.*] Ah, so the kitchen can handle 60 per hour and the counter can handle 62.4 per hour. The kitchen is the bottleneck—but only just.

RADU: That is indeed a very fine margin. Let me put both numbers on the picture. [*Annotates.*]



HAOYU: I have a question. The case says a stool is almost always free when the next customer gets their bowl. But if the kitchen is outputting 60 customers an hour and there are only 13 stools, how is any stool ever free at all? I know enough about math to know 60 is larger than 13. That does not add up to me.

RADU: Love the question. Anyone?

MING: The 60 per hour is a rate, not a count. Customers do not all arrive and leave at the same instant. They flow through over time. At any given moment, the number of customers actually sitting is determined by how fast they arrive *and* how long they stay.

FARAH: Exactly, it's Little's Law again: $I = R \times T$, where R is the throughput and T is how long each customer occupies a stool. The throughput is $R = 60$ per hour and the flow time is $T = 12.5$ minutes, so $I = 12.5$ customers.

[*Radu writes as Farah speaks.*]

$$I = \frac{60 \text{ customers}}{\cancel{\text{hour}}} \times 12.5 \cancel{\text{minutes}} \times \frac{1 \cancel{\text{hour}}}{60 \cancel{\text{minutes}}} = 12.5 \text{ customers}$$

Out of thirteen stools, that leaves about half a stool free on average. Not much—but just enough for the next customer to find a seat.

HAOYU: Of course, of course. [*Turns around to everyone in class.*] Sorry all for the quite stupid question.

[*Everyone in the class makes a brief verbal assurance to Haoyu in hushed voices—"no problem", "I had the same thought".*]

I know restaurants, numbers not so much. While I still find it hard to accept that the chefs are the bottleneck and not the stools, I think I believe the numbers now.

RADU: You believe the numbers more than your intuition Haoyu?

HAOYU: Let's just say I believe the numbers as far as they go. But I still wish they aligned with my intuition. I have learned to doubt numbers that don't fully add up for me.

RADU: As one should. Can someone help Haoyu's intuition?

CAMILA: It's just what the case says, no one waits for a seat. All the waiting is done by people who do *not* yet have noodles in hand. And so the picture is right, the triangle really is in the right place in the figure. These numbers just reconfirm what we can see with our own eyes.

HAOYU: Apparently so. Maybe I am not doubting this logic so much as doubting the case as writen.

[*Some uncomfortable laughs from the students.*]

RADU: I can assure you this is based on real establishments. That being said, it is always good to doubt and ask questions. [*Pauses.*] Now, why should we care so much about which one is the bottleneck? Maybe start here. Why do people put up with this line at Suzu's?

BINESI: Because the ramen is good and they know it will be worth it.

MING: Plus, the line is moving. It is not the kind of wait where you feel forgotten. You see your progress.

HAOYU: And when you are waiting outside, you can see through the window. You can see that essentially all the stools are full of people eating and enjoying great ramen. You can see the chefs working quickly as people wait in line. The whole operation is visible to you.

RADU: And what conclusion do customers draw from looking through the window?

HAOYU: The stools are full basically until someone new is ready to sit down. This makes it looks like the line is slow because of the people eating. You get the sense that if those people finished and left, the line could move along and there would eventually be a spot for you.

RADU: And is that conclusion correct?

BINESI: [*Pointing again at the numbers on the board.*] No. The kitchen can only produce 60 bowls per hour. Even if every stool emptied right now and stayed empty, the kitchen would still serve only 60 people an hour. Faster eating would not change that number. Eating is not the bottleneck.

CAMILA: But the customers do not have access to the numbers on the board. They see what they see: essentially occupied stools—only 0.5 of a seat available on average—and a line to wait in. A natural inference is that the stools are the constraint. That is what all the customers are thinking,

MING: Plus, they see the chefs working hard. They are not likely to blame the chefs for the wait, are they?

RADU: So what the customers believe and what is true are two different things here? Can I write both down? [*Writes on the board.*]

Actual bottleneck:	kitchen
Perceived bottleneck:	the stools

MING: I am left with a "so what" here. Why is this distinction important? Customers still wait the same amount of time no matter what they "perceive", no?

RADU: Love the "so what" instinct here. Let me see what others think: does this perception change how customers behave?

[*A pause.*]

 Christopher Thomas Ryan and Nanxi Zhang, 2026

BINESI: If I believe the seated customers are why I am waiting, then when I finally sit down myself, I feel obligated to eat fast. Those people in line can see me eating. From their point of view, I am the reason they are still outside.

CAMILA: The misperception creates social pressure. Customers believe they are the constraint, and that belief makes them behave as if they are.

RADU: Does this wrong belief benefit Mei?

CAMILA: In a way. She gets fast eaters for free.

HAOYU: I can relate to this. When I ran my ramen shop, I always made sure the open kitchen looked busy even when there was not so much to do. The perception of busyness mattered as much as the busyness itself.

BINESI: Yes, yes, we know, Haoyu. Keep them busy until they bleed.

HAOYU: [*Pointing at Biensi with a smile.*] Just not into the food ...

[*Everyone laughs and then the room gets quiet.*]

MING: Wait, wait, wait. I think I am confused about Haoyu's example, and even something I said earlier. I said people might not think that the chefs are the problem because of how busy they are. But them being busy is *exactly* the problem. They are the bottleneck!

[*Everyone takes a moment to think, puzzled.*]

CAMILA: [*Breaking the silence.*] That is a point I hadn't thought about before. We may tend to think that what slows a process down is laziness, and so when we see people busy, we overlook them as a source of problems.

RADU: Very insightful point. It makes me feel there is indeed something quite counter-intuitive about how people understand the idea of a bottleneck. It is maybe easier to mistake than we think.

HAOYU: We like to see others work hard on our behalf, even if it is not in our best interest.

[*An awkward pause and the idea sets in.*]

RADU: I am going to leave that there, I want some time to think about what was shared today. [*Pauses.*] For now, let's return to the CitySpoon proposal. Where are you all with their proposal now?

HAOYU: Can I say something about the ramen itself?

RADU: Who better?

HAOYU: A fifteen-minute delivery window for a dish that is best in five minutes is not a small concern.

CAMILA: That may be true, but customers ordering on CitySpoon may have never had the five-minute version. If so, they do not have a reference point for what they are missing. A bowl that arrives in fifteen minutes might still be very good by the standards of any other ramen they have eaten—just not by Mei's standards.

HAOYU: That argument works until word gets around that the ramen is better in the restaurant, at which point the delivery version has damaged the brand. I have seen this pattern.

BINESI: There is also the question of what Mei has staked her identity on for six years. It breaks the whole discipline of coming, getting your ceramic bowl, and eating quickly at a stool.

RADU: So far, I think you are articulating concerns Mei herself could articulate. The case ends with her grasping at something more elusive. What is this getting at, do you think?

FARAH: CitySpoon estimates 24 to 30 additional orders per hour. The kitchen currently handles 60 orders per hour for dine-in customers. If 24 to 30 of those are now redirected to delivery, then dine-in customers receive only 30 to 36 bowls per hour.

CAMILA: Redirected? The case says these are *additional* orders.

FARAH: Additional orders, yes. Not additional bowls. The kitchen is the bottleneck. It was already making 60 bowls per hour. It cannot make more.

CAMILA: [*Pauses.*] So every delivery bowl is a bowl someone in line does not get. I missed that before.

RADU: That's a dramatic and easily overlooked change. Does the CitySpoon contract change the seating capacity at all?

FARAH: No, it's unchanged. Delivery orders never occupy a stool. The stools turn at the same rate as they always did.

MING: So dine-in gets slower service from the chefs and so ...the line outside gets longer!

RADU: But is this so bad? Isn't a long line a sign the place is popular?

[*A long pause.*]

FARAH: No, no, no, we need to think about what is happening inside the restaurant. There are fewer dine-in bowls per hour, so fewer people are inside eating at any given moment. By Little's Law again: if dine-in throughput drops to, say, 34 per hour and eating time stays at 12.5 minutes, then average occupancy drops from $60 \times 12.5/60 = 12.5$ people to $34 \times 12.5/60 \approx 7$ people. Out of thirteen stools, that means about six are empty on average—compared to about half a stool empty before.

RADU: Let me make sure that picture is clear to everyone. [*Writes on the board.*]

Before CitySpoon: long line outside, $\approx \frac{1}{2}$ stool empty

After CitySpoon: longer line outside, ≈ 6 stools empty

So there are empty stools *and* the line is longer? How does that make sense?

[*A long silence.*]

Well, let me ask you this: What does a person in that longer line think when they see six empty stools once they approach the restaurant?

BINESI: They can't help but start to think that the kitchen must be slow. There is space available to sit, so why am I not sitting in it?

RADU: And are they right?

BINESI: Yes. They are correct this time. The kitchen *is* slow, even slower now. The actual bottleneck and the perceived bottleneck are finally the same.

HAOYU: But now, if I know the kitchen is the bottleneck and not the other diners, why would I rush? Taking five extra minutes over my bowl costs no one anything, from my perspective. The next person in line is waiting for the kitchen, not for my stool. The evidence of that is the empty seat next to me.

MING: So is that Mei's second concern? CitySpoon never touches a stool, but it still changes how long people sit on them.

[*A brief silence. A few students nod.*]

CAMILA: But let's not get ahead of ourselves with admiring this conclusion. Even if every delivery bowl comes out of the line, is there not a scenario where revenue still goes up? Maybe CitySpoon customers pay more per bowl. Maybe we can scrimp a bit on the serving size for takeout.

HAOYU: Camila, the revenue from delivery is usually more complicated than that. First, it depends on how much do you plan to price your foods on these platforms. If you plan to price it higher than what's shown in your shop, it reduces demand and risk the reputation of inconsistency. If you price them the same, usually your profit is lower than offline because platforms like CitySpoon also charge a commission fee, sometimes as high as 30% of revenue.

MING: Also, aren't we worried about things spiraling? Like the lines get so long and frustrating, the demand dries up? If the experience degrades, some loyal dine-in customers switch to ordering on CitySpoon instead. That further reduces dine-in revenue while keeping delivery demand high. More kitchen capacity goes to delivery. The dine-in experience degrades further. And so on.

CAMILA: All of this seems a little alarmist, no? If revenue goes up, who really cares?

[*Another pause.*]

RADU: I like Camila's question. Isn't Mei all about maximizing profit? Whatever brings in the money is the right decision, no?

CAMILA: Amen.

BINESI: I don't agree at all.

RADU: Why not?

BINESI: Look at the facts. Suzu's has thirteen stools, and opens for two and a half hours a day, six years and running. Does that sound like the setup of someone trying to maximize profit?

CAMILA: I couldn't agree more. Mei runs a very bad business. I would never invest in Mei's enterprise here; she has no idea how to generate revenue, even balking at this CitySpoon opportunity. It's shameful.

BINESI: Wait, wait, a second. I said Mei was not trying to maximize profit, not that she runs a bad business.

CAMILA: What's the difference?

BINESI: For me, a lot. A perfectly executed small operation has its own beauty to it. It makes enough profit, I am sure.

CAMILA: *Enough* profit? What does *that* mean?

RADU: Haoyu, it looks like you seem to want to jump in here.

HAOYU: Yes, I just look at the simple fact that there is a line up around the corner at Suzu's. To me, that's success. In the restaurant world, the number of stools has very little to do with whether a place is good or whether the owner is satisfied. Some of the most respected establishments I know of have even fewer stools than Suzu's.

CAMILA: I still wouldn't invest in it, nor your friend's so-called "respected" businesses.

BINESI: [*Haughtily.*] Are you sure they would even want you as an investor?

MING: Right, maybe you should invest in CitySpoon, they are the ones who seem to be after profit by preying on successful businesses.

[*Camila opens her mouth to answer.*]

RADU: [*Cutting in.*] Why is everyone so testy today? All the talk of ramen is making us hungry?

MING: I could go for some ramen right now if Radu's buying.

RADU: I won't go that far, but maybe that is a sign we should wrap it up here.

Email

Dear students, I want to use this email to fill in a few things that the discussion passed over quickly, and to offer some context for the observations you were making. I should also say that class left me with a few new thoughts I have not finished thinking through. I share a few of those thoughts near the end.

Resource pools. The two chefs at Suzu's are an example of something worth defining precisely: a *resource pool*. A resource pool is a set of resources that are interchangeable, i.e., each one can execute the same task, and any unit of work can be assigned to any member of the pool. The two chefs are interchangeable in exactly this sense: either one can assemble a bowl, and an arriving order can go to whichever of them. When resources form a pool, their capacities add. If each chef can assemble 30 bowls per hour, a pool of two chefs can assemble $2 \times 30 = 60$ bowls per hour. More generally, a pool of n identical resources, each with individual capacity C, has a combined capacity of

$$C_{\text{pool}} = n \times C.$$

This may seem obvious in the two-chef case, but it is easy to get wrong in more complex settings. The key condition is interchangeability: the resources must be able to process the same flow unit in the same way. If the two chefs were not interchangeable, say, one could only make the broth and the other could only plate, then their capacities would not add in this simple way, and we need to analyze them as a serial system rather than a pool. We will encounter resource pools frequently in what follows, and it is useful to have a name for them.

Customers as co-producers. One of the more striking observations from today's class was Camila's point about social pressure at Suzu's: customers eat quickly and leave promptly because they believe they are the constraint, and that belief, whether correct or not, benefits the operation. This says something important about how service operations work.

In most of what we have studied so far, customers have been inputs: they arrive, they are processed, and they leave. But in service operations, customers are frequently doing something more than that. We saw this already in the OneWay case, where customers provided information the workers needed. Here

the customers seem to be doing even more. They are doing work the system cannot run without—eating noodles! At Suzu's, customers find their own stools, manage their own pacing, and participate in a shared norm of efficient throughput. The organizational theorist David Bowen formalized this observation in a 1986 paper that has since become foundational in service management: customers in service settings can be managed as *partial employees* [1]. They bring effort, attention, and coordination to the service encounter, and that contribution is part of what makes the system function. The 12.5-minute average stool occupancy may at Suzu's may seems like a passive empirical fact about how long ramen takes to eat. But it is also partly the result of customers choosing to eat at a particular pace. It is a choice they make, however unconsciously, as participants in the social order of the counter.

If this is right, it has a practical implication. When we calculate the capacity of Suzu's counter at 62.4 customers per hour, we are implicitly relying on customers continuing to behave as they do. The number is not just a property of the stools and the eating time. It is a property of the stools, the eating time, and the social system that keeps the eating time at 12.5 minutes rather than 15 or 20 minutes. If CitySpoon threatens the capacity of the seating resource, it does so not by changing anything physical, but by changing the social system that the physical capacity depends upon.

I hope this perspective gives you some idea about the limit of analytical analysis. Calculations under our current configuration can provide useful understanding of our current operation. But when we plan to change that configuration, we should check carefully if the parameters in the old systems are still applicable. Sometimes their changes can be subtle, but ignoring the change can lead to unreliable predictions of the new system.

Operational transparency. There is another feature of Suzu's design worth noting: the counter wraps around the open kitchen. Customers sitting at the counter can see the chefs at work, and customers waiting in line can see through the window. This is not merely aesthetic. Ryan Buell, in a widely discussed 2019 piece in the *Harvard Business Review*, has argued that the deliberate design of windows into the organization's operations changes how customers experience the service they receive [2]. When customers can observe the work being done on their behalf, what Buell calls *operational transparency*, they tend to feel the wait is more fairly earned, they place higher value on the service, and they are more patient. You are not simply standing in line; you are watching your bowl being assembled. The waiting and the product are connected, visible to you as a single continuous act.

At Suzu's, I suspect this visibility also plays a part in sustaining the perceived bottleneck. The kitchen looks appropriately busy. It is clearly working. This is consistent with the story customers tell themselves while waiting: the bowl is being made, the chefs are moving, the constraint must therefore be somewhere further downstream, in the people eating ahead of me. If so, the transparency reinforces the misperception rather than correcting it, and in doing so reinforces the social contract. A hidden kitchen—a closed door, a partition—might remove that reassurance, and with it some of the patience that makes the line manageable. I should admit that Ming's question in class makes me less sure of all this. If the bottleneck is the busiest resource, a busy kitchen ought to be a clue, not a cover. I do not yet know why so few of us read it that way.

When the machinery becomes visible. The previous section described Suzu's open kitchen as something whose visibility is valuable—customers see the kitchen working and feel better about waiting. But let me now describe a different kind of visibility, which I think may have the opposite effect.

The sociologist Susan Leigh Star, in a 1999 paper on the nature of infrastructure, made the observation that the systems we depend on most are precisely the ones we are least aware of [4]. The electrical grid, the plumbing, the supply chains that stock grocery shelves are essentially invisible to us until they fail. When the lights work, we do not think about the grid. When they go out, we suddenly think of almost nothing else.

I think the operations of Suzu's work in much the same way. When the system runs smoothly, its mechanics are invisible to everyone working inside it. Customers eat, leave, and make room without experiencing any of that as operational work. They are not thinking about throughput or utilization or bottleneck status. They are thinking about the ramen. Perhaps the social contract to eat quickly give up your seat works precisely because its terms are never stated, and the system's mechanics are never fully legible to participants as mechanics.

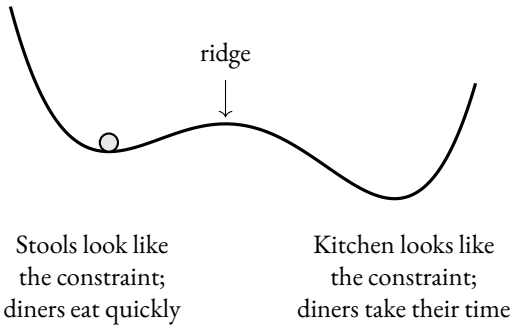
One could argue that CitySpoon would not increase the first kind of visibility—customers would still see the kitchen working, still watch their bowl being made. What it would do is introduce the *second* kind of visibility: the kind that arrives at the moment of breakdown. When the line is longer than before *and* six stools sit empty, customers would suddenly become aware of the system's structure. They would correctly diagnose the kitchen as the binding constraint for dine-in customers. The operational mechanics would become legible to them. The machinery would snap into focus at the exact moment it was no longer serving them well.

Two equilibria. I want to offer one more lens on why the CitySpoon problem is not just a matter of slightly worse service but potentially something closer to a collapse. To do so, I will borrow an idea from the mathematics of dynamical systems: the study of how systems change over time. But I promise not to use any mathematics.

Imagine a ball resting in a shallow valley. If you nudge it a little, it rolls back to the center. The valley holds it. Now imagine two valleys side by side, separated by a low ridge. The ball can rest stably in either one. A small nudge from the left valley, and the ball rolls back. A large enough push, however, sends it over the ridge and into the right valley, where it stays. The right valley does not push it back to the left; it holds it just as firmly as the left one did. Mathematicians call this *bistability*: two stable equilibria, each self-sustaining, with a threshold between them that, once crossed, is not easily un-crossed.

There are two configurations the system can settle into, each internally consistent. In the first, customers in line believe the stools are the constraint. This belief is maintained by what they can see: a nearly full counter, people eating efficiently, visible progress toward a seat. Because they believe they are the constraint, seated customers eat and promptly leave as the next customer gets their noodles, which keeps the counter nearly full and the turnover fast, which is precisely what makes the counter look like the constraint. The belief produces behavior that confirms the belief. The system is self-sustaining.

In the second configuration, customers believe the kitchen is the constraint. This belief would be maintained by what they can see in a post-CitySpoon world: a long line outside and several empty stools inside. Because they correctly perceive the kitchen as slow, there is no social pressure to eat and leave quickly—rushing would not help anyone in line. Seat occupancy time grows. Fewer stools turn per hour. The seating resource, which was previously well above the kitchen's capacity, starts to close the gap. The system settles, more slowly and less pleasantly, into a new steady state.



What I find unsettling about Suzu's current arrangement is that it is the first of these two configurations—the good one—that is fragile. It depends on a misperception being continuously maintained. I suspect that the moment something makes the true bottleneck legible to customers, the misperception corrects itself, the social pressure to eat quickly dissolves, and the system tips toward the second configuration. The first configuration is stable, but only just: it holds against small nudges. The ridge between it and the bad equilibrium (depicted in the table above) is not very high.

CitySpoon could be the push that sends the ball over the ridge. And here is what makes this more than an academic concern: there is no guarantee the system returns to the good equilibrium if you remove CitySpoon later. By the time the counter is visibly half-empty on a regular basis, customers will probably have updated their model of the system. The social contract would be broken and re-establishing it would require customers to unlearn the correct belief they have acquired and revert to the convenient misperception that made the original system work. That is not something a manager can simply decree. The technical word for this kind of asymmetry—where the path into a bad state is easier than the path out of it—is *hysteresis*. Mei may not know this word, but I suspect she senses the phenomenon. It is, I think, the thing she could not articulate.

On small businesses. According to Statistics Canada, small businesses—those with fewer than 100 employees— employ approximately 46 percent of the private sector workforce in Canada [3]. The typical place of work is not a multinational firm but something closer to Suzu's. Business schools discuss large firms disproportionately, partly because the data on large firms are better, and partly because many students aspire to work for them. But I believe many of the concepts we are developing this term apply just as much to a thirteen-stool counter as to a multinational corporation.

A student came to speak with me after a version of this class many years ago. She told me it had changed how she thought about her father's business—a yard maintenance company he had built and run for decades. She had looked down on it for most of her life, without quite realizing she was doing so. She had wondered why he did not expand, why he did not diversify, why he seemed content to stay exactly the size he was. What the case discussion had given her, she said, was a way of seeing that her father's business was not small because he lacked ambition. It was small because he had built it carefully, calibrated it precisely, and chosen not to put at risk something that was working. His employees were satisfied, many of whom were new immigrants who struggled to find stable work. His customers came back. He could explain every part of what he did and why. She left the conversation with considerably more respect for what he had built, and I left it reminded why I love teaching business.

Warmest, Radu.

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Extensions

[*Posted as homework on the course's website for this class session.*]

1. The class found the kitchen bottleneck by a whisker: 60 versus 62.4 customers per hour. Test how thin that whisker really is.

   (a) Suppose the social contract erodes slightly and the average stool occupancy drifts from 12.5 minutes to 15. Recompute the counter's capacity and identify the new bottleneck.

   (b) Find the exact occupancy time at which the bottleneck flips from the kitchen to the stools. Express your answer in a sentence designed to alarm Mei.

   (c) Once the stools become the bottleneck, what does Little's Law say about customers standing bowl-in-hand? Describe the scene inside the restaurant.

2. Treat Mei's stool count as a design decision rather than an accident.

   (a) Given the kitchen's 60 per hour and the 12.5-minute occupancy, find the minimum number of stools that never leaves a customer standing with a bowl in hand.

   (b) Now suppose Mei had installed 20 stools instead. Compute the average number of empty stools under normal operation, and explain what the view through the window would do to the perceived bottleneck—even with no CitySpoon anywhere in sight.

   (c) State the design principle in one sentence: what is the perceptually optimal number of stools for an operation whose kitchen is the true constraint?

3. Connect the bottleneck to our inventory buildup machinery. Suppose that on a typical day, 50 people are already waiting when Suzu's opens at 11:30, and new customers join the line at 40 per hour throughout the lunch window.

(a) Draw the inventory buildup diagram of the line outside from 11:30 to 2:00 pm. Does the line clear before closing?

(b) Compute the total person-minutes spent waiting in line over this time, and the wait faced by the very first person versus someone arriving at 1:00.

(c) Now redo the picture with CitySpoon taking 25 bowls per hour of kitchen capacity.

(d) If you were Mei, how would you approach the customers still waiting in line at close (2:00 pm)?

4. Ming raised a genuine puzzle in class: the bottleneck is typically the busiest resource—yet the sight of a resource working hard may precisely be what convinces us it is not to blame for our wait.

   (a) Find a real operation where the hardest-working, most visible resource is the true constraint and yet escapes all blame. Then find one where an idle-*looking* resource absorbs blame it does not deserve.

   (b) For each, say what the customers can see, what they cannot, and what inference the visible evidence invites.

   (c) What should a manager conclude about *staging* visibility? Is arranging what customers see a form of honesty, of theater, or of manipulation—and where is the line?

5. Suppose Mei rejects CitySpoon but opens her own takeout window, selling a modified dish designed to travel—noodles packed separately, broth in a sealed container. Takeout customers form a second, visible line at the window.

   (a) How does this situation, if at all, differ from taking the CitySpoon proposal?

   (b) State the general principle: is the danger to Suzu's from competing demand, or from *invisible* competing demand? Defend your answer.

6. The email argues that Suzu's customers are partial employees. Let's examine this position.

   (a) List every task Suzu's customers perform without pay.

   (b) For each task, describe what it would cost Mei to accomplish the same thing with paid labor or physical design (a host, posted time limits, reservation software).

   (c) Customers work this unpaid job for something in return. What are Suzu's wages to them—and which of those wages, exactly, would CitySpoon cut?

7. The email's hysteresis argument implies that "just try CitySpoon and see" is not a safe experiment: the path into the bad equilibrium is easier than the path out. Design a cheap, genuinely reversible pilot Mei could run to learn about takeout demand without taking on the CitySpoon proposal.

Reflections

[*Posted as a reflection exercise on the course's website for students to write about in a journal due at the end of semester.*]

1. Binesi said that once seated, she would feel the eyes of the line and eat quickly. Recall a time you hurried, maybe at a checkout, a gym machine, or a parking spot, because someone visibly waited behind you. Do you interpret the pressure as an imposition or a genuine sense of achieving justice?

2. The class discovered a false, but consequential belief: customers eat quickly because they wrongly think they are the constraint. Have you ever held a mistaken belief that made you behave better than the truth would have? When you learned the truth, what happened to the behavior?

3. Think of a long wait in your life where you blamed the people ahead of you—the slow orderer, the chatty patient, the lingering diner. Looking back, was the real constraint somewhere else entirely? What did your misdirected blame let the institution avoid?

4. Recall standing in a line while something sat visibly idle—an unstaffed register, an empty table marked reserved, a dark checkout lane. What story did you tell yourself about the organization in that moment? Based on today's discussion, do you think about it differently?

5. Camila said, "We like to see others work on our behalf, even if it is not in our interest." Where do you reward visible effort over results—in colleagues, in service workers, in yourself? What does that preference teach the people around you to perform?

6. Hysteresis is the situation where the path into a state is sometimes far easier than the path out. Name something in your own life that was easy to start and has proven hard to unwind—a convenience, a habit, a standing arrangement. Did you know, going in, that the door swung much more easily in one way?

7. The email closes with a student who had looked down on her father's yard-maintenance business until this material taught her to see its value. Whose small, deliberately unscaled operation have you underestimated? Why?

8. The ceramic bowls are not allowed out of the restaurant—a rule that looks like preciousness and turns out to be load-bearing for the success of the business. What rule do you keep that others find rigid or fussy? What is it secretly holding up?

9. Have you seen other business where their true bottlenecks are different from customer's percieved bottleneck? Does this misperception benefit or hurt the business owner? Can this misperception be designed?