

## MITOCW | Ses. 1-6: Value Stream Mapping Basics

The following content is provided under a Creative Commons license. Your support will help MIT OpenCourseWare continue to offer high quality educational resources for free. To make a donation or to view additional materials from hundreds of MIT courses, visit MIT OpenCourseWare at [ocw.mit.edu](http://ocw.mit.edu).

**PROFESSOR:** First, I want, on a personal note, I went through the course this summer and I'm really happy to see so many health care, or so many attending from the health care sector, because I think in the future it's going to be quite impossible to function in good structures without knowing something about this process improvement, Lean Six Sigma. Because otherwise, I don't think that you're going to be able to contribute in a good and productive manner. So, really important, and very nice to see you all here.

All right. At the end of this, you'll be able to sketch a basic value stream map, demonstrate some basic analysis of those maps, and then recognize some steps for process improvement using your value stream map. You recognize this? Back to the hot dog stand. And it may not look exactly like the ones you made. So, starts with taking the order, placing it in the "in" tray. Get the order, cook the dogs, put them in the bun, and wrap them at the fruit.

And then it's a question of, do they need another hot dog or not? If they don't, they will go up to the order out, if they do then you go over. Check if the order is OK. At the beverage delivered to the customer, and the customer leaves with their hot dogs. So, value, as we think about it in Lean, is really value for the customer. it's not value for us.

And in particular in health care, we know so much about the engineering side. But in health care we really have a difficult time coming to terms with this. We struggle with it, because it is oftentimes about, how do things work best for us, and not so much, how do things work best for the patients?

If it was the other way, we probably wouldn't have waiting rooms. We do have waiting rooms. We have waiting rooms all over. In fact, I work in the Emergency Department over at BI, and we have recently decided that we're going to make it a formal process to open our waiting room.

Because we don't really want it, and it's going to be paged out as a formal process, as a formal step, that now we decide we open it, and we will not have it open if we have any open beds in the Department, because it doesn't make any sense.

Anyway, that would be value for the customer. Identify the value stream, map out the end to end linkages between the processes, what goes on. Then we focus on making flow continuous from one end to the other. Pull, that we heard about earlier on. Let the customer pull the value rather than us producing a whole bunch of things that then get piled up and some of it gets wasted.

Then we do it over and over again, because we're never really going to reach perfection. But we're going to strive for the perfection. So value stream mapping, it's a tool to improve our processes, our whole production, by identifying steps that add value. And also by identifying waste in our processes. We follow the value creation process, we talked about, from one end to the other.

And you need to go to Gemba to get out there and see what happens. You can't sit in an office-- you can sit in an office and you can think that you know what is actually happening. But in reality you don't. I have some examples, I'll get to that a little later, from our final hospital, if we have the time. But when you go and look at what actually takes place, you get surprised, even in the environment that you work in yourself.

Because we all think that we have the solutions to the problems that we encounter, and sometimes we do, and sometimes we actually don't. The value stream map is the process maps that we've done. Some of you have already added your data. It can be time data, it can be quality data, inventory, resources, people, things, and whatever else. But don't clutter your maps with things that are not really useful for you.

So there are some steps to creating these value stream maps, and the first is to define customer value, and then the process. And we can discuss what customer value is. That is a debate you can see among yourselves here with the maps that you've created. You did not all agree on what adds value, what customers potentially would be willing to pay for.

An example. We've just done a Lean project with our registration people. Patients need to be registered, right? And is that a value added process? We weren't quite agreeing on that, at least not initially, because you can say, well, I mean, patients, they don't care. But in fact, if you dig a little deeper they probably do, because if you aren't registered, your visit is not linked to your record, and then it's not part of your history. And then it's hard to tie everything together.

So identify the value added and the waste steps is the next one. And then, in order to change things for the better in the future, you need to understand what you're currently doing. So you do a map of the current state. Where are we now? And then you analyze that map and you find opportunities for improving things. You can look at bottlenecks, you can look at work load balancing, and you can have that as an open discussion of what can you make better.

And now you've just heard the module on people. And that's actually interesting. If you involve everybody in this process, you can get a lot of good synergy in it. And by involving some of the skeptics you can actually win them over sometimes. We've done that too, surprisingly enough. But it is possible. Then you use that to create your future state map, and then you make an action plan for how you are going to get there.

And I think we'll get to that on day three, in the A3 thinking. All right, we're back to this one that follows the value creation process. And you have, in your groups, assessed the values and the wastes for each of the processes. And now it's time to add some data. I think that we'll just go with the map that you had handed out, all the data should be on it.

Time's in seconds, and there's some quality measurements as well, because the processes there weren't perfect the whole way through, right? It was 100% every time. We know our demand, our current demand at least, for the 50 customers. And we know how long we're open, so we know how long time we have to fulfill the orders as they are.

The takt time is our available times. It's 4 hours time 60 minutes, that should be 240 minutes. And the demand is 50 customers. So we have 4.8, or 288 seconds per customer. We also know that the cycle time from what we added up is actually 446 seconds. So we can all understand that they're pretty stressed, right, because they're spending more time than they really have.

And then there's the alternative calculation where you've taken the set out and the clean out time out. Some of you might have been thinking about that and done that when things are slow. And that gives you a little shorter takt time. But there's still an imbalance between the takt time and the cycle time. So you're still in the negative.

But you have two workers. So the question is, can you meet their demands? All right. If you take the second handout that you got, with the different processes on, write down in your groups. You have 10 minutes, you'll get a warning after 7. Write down who is doing what, how much time they're spending, and then as well whether it's value added or non value added.

All right, we're going to start off here because you look very ready. You're starting to search for solutions, here. Sasha, how much is he working, or she.

**GUEST**

159, OK. Andy? 224. OK, now, Wait and Neither should be the same. So let's look at value added, non value

**SPEAKER 1:**

added. 209, 174, 63 wait. All right, that seems reasonable. Let's see if other folks agree. And again, just like last time, these things are kind of open to interpretation. Hopefully, actually, this mix is pretty prescribed, but this is up to your judgment. So we're expecting some different answers here.

So this time we've got, basically because we constrained the problem down, these answers tend to agree, these are still, people have different opinions about different things. And so we have a fair range there. But it does look like, as an over all, that this isn't a bad process. There's more value added than non value added. So that's pretty good, actually. So these people are not wasting their time.

But there is a substantial fraction of non value added and wait time in the process. And what can we say about Sasha and Andy? Balanced process? No. That may be an opportunity to do better, and gets right at this issue of, well, our cycle time, our takt time, the time that each individual person is working don't match up right now. So back to Bo, and we'll see where we can go from here.

**PROFESSOR:**

And you could also say, with the differences on the value added and the non value added time, what would you do to understand that better, now we're sitting and doing it on paper here?

**AUDIENCE:**

I can't answer that question.

[LAUGHTER]

I have another comment. We watch the process.

**PROFESSOR:**

Yeah.

**AUDIENCE:**

You could go and watch the process.

**PROFESSOR:**

Go and watch the process. And how about talking to the people there, right? The customers.

**AUDIENCE:**

That brings me to that, in CQI you would give it, I can't actually remember now, it's been a while since I've implemented these. But we would give it a number. So that not every unit of Andy and Sasha would equal 1. And I think maybe we would value some of her chit chat as personal relations that actually people may be coming back to get the hot dogs.

Not because hot dogs are great to eat and they love these hot dogs, but she brings them back. So her time spent chatting, although taking up time, may be given more than one, or his less than 1. So they may be doing balanced work if you look at it on a deeper level.

**PROFESSOR:**

At least that's an assumption until you have clarified with the customers whether this is really something that they value.

**GUEST** That's actually a comment that can be taken in a couple of different directions, right. Right now this is absolute

**SPEAKER 1:** time spent doing everything. So based on this, should Sasha chit chat more or less? Does it do any good if she does less? No, actually it solves nothing and makes the customers annoyed. So maybe more is the answer there. That's right.

Yeah, and now this is just the time, right. You're also getting into sort of a value judgment of who is doing more for the company, and that's dangerous, so we won't go there very far. But certainly it's not hurting anything for her to keep doing that right now, because she's actually underutilized compared to Andy. OK, so we're actually going to do some numbers on that thought.

**PROFESSOR:** Yeah, and we are going to do, let's see here.

**GUEST** Click, there we go.

**SPEAKER 1:**

**PROFESSOR:** If we look at Sasha's tasks, we all got 159. 50 orders. So she is working 133 minutes out of the 240 minutes available. And Andy was 224 seconds per order. So working effectively 187 minutes out of the 240 minutes available. And so their work time, or their workload. Sasha's working 55% of the available time and Andy is 78 of the available time.

And their capacity, if you, let me see here, the touch time per order, if you take the waiting time out, should be 224 seconds, which is defined by the one that's the slowest, which is Andy. OK. So if you say that's 224. So they should be able to serve 64 customers.

**GUEST** That's if Andy maxes out.

**SPEAKER 1:**

**PROFESSOR:** Yeah, working 100% of the available time. That's not always a good idea. It's hard, at least. So we're not going to talk about the variations right now, we're going to do that later.

**GUEST** We got a question here?

**SPEAKER 1:**

**AUDIENCE:** Yes. Just looking at this data, if we were analyzing this company saying, what can we do to create a Lean process. Would our initial thought be, OK, what are the tasks that aren't needed and how do you delete them from the process? Or would we say, OK, what are the tasks that Andy's currently doing that we could, perhaps, reallocate to Sasha such that we have a more continuous flow to the process?

**PROFESSOR:** That is what you are going to be discussing in the next exercise that is coming up here in a minute or two. And then you can determine what you find more feasible.

**GUEST** Although you have a good point there, because the thing you said second is the one that's in the exercise. The

**SPEAKER 1:** thing you said first gets at that issue of, well, let's make Sasha more efficient. Or not, because as we get a little deeper into the analysis, we find that that's not actually going to help us. So hold the rest of that thought.

**PROFESSOR:** But the best first step is to do what you've done now and analyze what's actually going on. We saw that our current production, the 50 customers, is actually a little less than they can produce the way they're doing, or the way they could be doing things if they were working 100%. So they need to improve their processes in order to meet their growing demand. They're a popular stand.

Whether it's the talking, the chit chatting, or the quality of the hot dogs, we don't know at this point. But we can see that they're underutilized 55% to 78%. And their work is not balanced, either, and their cycle time per customer is too long, regardless of how you calculate it. So you should be able to shorten that by looking at it, OK.

And that is your next job. Help them figure out what they can improve. How can they improve their utilization? How can they reduce their cycle times? So now you can change the order that they do things in. And find out what they need to do in order to serve 75 customers and 100 customers. So this is 10 minutes.

**GUEST SPEAKER 1:** OK, so this is a brainstorm. That's actually sort of a technical term, right. Have people gone through brainstorming exercises before?

**AUDIENCE:** Yeah.

**GUEST SPEAKER 1:** So it's interesting, the medical people are saying yes. Engineers? Yeah, OK. So you're throwing ideas out there, no idea is rejected at this point. Let's just collect thoughts.

**PROFESSOR:** Let's start back up and hear if you have some suggestions for changes, improvement. Go ahead.

**AUDIENCE:** So we started to look at the process of just taking the orders, because it seemed like that was where a lot of inefficiencies were disseminating from. Or rather, a lot of the hold ups, from our chart, were coming from.

So we thought that it might actually be a better idea if there were precreated tickets, where a customer could write in their name, write in what they want. And then give it to Sasha. And then while Sasha was filling their drink order, they could pay her. And that would get rid of her adding the beverage later on, her rechecking the order, some of those inefficiencies.

The other bird that it kills is that, while wait time, capital wait time, might not change initially, the perceived wait time would change for the customer. Because if you hand them the drink ahead of time they have the perception that, hey, things are coming along.

**GUEST SPEAKER 1:** All right, yeah, that's good. They always bring the wine first.

**SPEAKER 1:**

**AUDIENCE:** Get your drink first.

**PROFESSOR:** So they can sell you an extra glass.

**GUEST SPEAKER 1:** Yeah, that's right. It's already gone by the time dinner comes.

**SPEAKER 1:**

**PROFESSOR:** Any other suggestions? Want to go, back table? Yeah?

**AUDIENCE:** So we've thought, for steps number 10 and 11, with some different preparation work, such as keeping double the amount of stocked items and double the amount of trash bins, et cetera, condiments, they could cut that time in half and only do that work every two hours.

**PROFESSOR:** Right, OK.

**AUDIENCE:** Since Sasha is not the one actually picking the order, she's just filling order tickets, she ought to help Andy out in the kitchen, by being the one to do part of steps 4 and 5. Yeah. If Andy puts the dog in the dinner, wraps it in foil, she can just add the fruits of choice and put it in a selling container. That way she doesn't have to recheck in step 7, because she's the one actually doing it.

So when we recalculate the numbers for that, originally right now it's 50 of value added time, 36 of not. From 4 to 8 is 36 of non value time and 33 of wait time. When we change what they're doing in each part of that, so that he's just doing the dogs and she's doing everything else, and we take out that sitting on the counter wait time, it all becomes 80 of value added time.

So we have no non value added time anymore, and no wait time. So we've eliminated all that. And we have 80 of value, versus the 50 that's originally there.

**PROFESSOR:** OK. Does it change any of the times in between the two of them?

**AUDIENCE:** Yeah, it would.

**PROFESSOR:** Sasha is going to work more?

**AUDIENCE:** A little bit more. 20 seconds more. She was originally, from 4 to 7, 21, and now she's 40.

**PROFESSOR:** OK. So those are seconds that is going from Andy?

**AUDIENCE:** From Andy to Sasha. We had a similar suggestion where Sasha would do some of the work of filling the container. But we kind of envisioned it as a flow or a [INAUDIBLE], and that she would fill the containers and then Andy could just look down and see how many containers are just waiting for him. And then he could just put the hot dogs in, wrap them up, and then you have a bag. They would already have the fruit. She would put the bun in the foil.

**GUEST** I like that. Very nice.

**SPEAKER 1:**

**PROFESSOR:** Other suggestions?

**AUDIENCE:** We have the customers getting their own beverage and putting their own toppings on. That cuts down on time, and it also reduces the errors. You're picking your hot dog, you can't screw it up. And then, the customer knows what they want. And it would also give them more control over particulars, ketchup versus mustard, or whatever. And we also have them getting their own fruit.

**PROFESSOR:** All right, very good. More suggestions? All right, so, what you have done here is, you have rearranged some of your processes. You have changed the workload in between the two in the business here as well. So that they're working more even, or have a more even workload. And you're involving the customers, saying, customers can do some stuff themselves.

They can pick up the fruit, they can pick up the drink. Don't need to have someone doing that for them. Right. And some of you focused on reducing the, or involving the customers, to make the wait time go down as well. I like that. What else do we--

**GUEST**

**SPEAKER 1:**

So did anybody go to Fresco's today? That lunch place, a little deli, catty corner. I guess not, no. They have a great system there, which is apocryphal. I'm not sure if this story is true. But I know one of the Saturday Night Live people actually lived in Cambridge for a long time. It's alleged to be the "cheeseburger cheeseburger" inspiration. You say what you want in a yell, right. There's no ticket, there's no, you know.

And then they yell back, to make sure they understood the order. BLT small fries! BLT small fries! Takes one second to say, low error rate. High training, that guy has got to keep it in his head, right. Yeah, so, most of the other possibilities are definitely up here, some good ideas.

And this part, by the way, is also pretty realistic, in the sense that this is art. You don't know the answers, none of these techniques tell you the answer. What they do is frame the problem and help you understand what problems you're trying to solve. You're not trying to make Sasha stop chatting. You're trying to improve the overall performance of the system.

One question we have with this is that not all the time was allocated, and it's unclear exactly why the wait times are the way they are. The question of the flow of orders, and so maybe from 11 to 1 they are at capacity, and there's just no demand 10 to 11 or 1 to 2. So there might not even be the opportunity to increase the capacity to hire another person or to do something different.

**PROFESSOR:**

And that's the kind of thing you would find out by actually going and observing the process, rather than us sitting in a classroom here and saying, this is the way it is.

**GUEST**

**SPEAKER 1:**

That's right. On the other hand, there are things that always help, even if there is that issue of, maybe some of the time they're slammed. Balancing always helps. Eliminating non value added steps always helps. So there are some things you can do confidently. There are other things that you may have to actually go and see, well does this make sense. Will this work. And possibly even experiment with, try it, see how it goes the next couple of days.

**PROFESSOR:**

So, a few things that we thought about. The "in" order, where it's sitting, what is it, 30 seconds, here in step 2. And the "out" order. Take those away. Inspection, we heard earlier, that inspection doesn't add much.

**GUEST**

**SPEAKER 1:**

I really like this. I don't think I've heard that one before. The thought of consolidating Sasha's work and the inspection into one step. So then you get the quality, but there's no extra step. So, that's a good solution to not a priori eliminate inspection, which might lead to quality issues.

**PROFESSOR:**

And balance the work you've already done, as well. Now we're down here to create a future state map to visualize how we want this to look in the future. And then, create the action plan for how you're going to achieve your change. Because talk alone won't do it. So, make the map, create a plan, set some deadlines, and assign some responsibilities for who's going to do what to change things.

So the value stream map is useful to visualize what is going on in the interactions and the flows, and gives you the linkages between your information and your product flows. It gives you a language that you can talk about with the ones who are in the group. And you can identify your constraints and capacities and wastes.

**GUEST** Do you have a question?

**SPEAKER 1:**

**AUDIENCE:** I just have a question about the process. Maybe I'm having difficulty visualizing it. But it seems like we're following the hot dog in a linear way, whereas it seems like some of this stuff happens simultaneously. So I'm not sure, some of the seconds overlap. It's not like Sasha's seconds happen only after Andy's seconds happen. So that's a little bit hard for me to understand in this flow model.

**PROFESSOR:** And that, as I perceive it, that can sometimes be a problem to look at it like that in a process map. And I have a slide a little bit later where you can look at swim lanes, as well. Because it can depend on who is doing what. And that can happen at the same time as well. So you're absolutely right. They do happen simultaneously.

**GUEST** The classic issue, which you're keying on, I think, is like, in a real hot dog stand there would be a bunch of hot dogs on the grill that would be cooking at the same time that all this other stuff is going on, right. So there are some processes that are maybe out of phase. And that's true. That's a real issue. The map doesn't catch that very well. That issue of some things happening out of phase with other things. But it's a tool. It's not a perfect tool. It doesn't solve all of your problems.

**PROFESSOR:** All right. So, tips for creating it, involves the entire team. Everybody who's involved in these processes need to be involved. It can't only be a few people that maybe have management positions. You need to have the people doing the work come and be involved in this. Because they're the ones who understand the work the best, and can come up with the best suggestions for how to change it.

And you need to actually go to Gemba, go and see, use the post it notes like you've done now, on your map, put that on. And then you can use your symbols, you can use whatever you pretty much like. There are some that are more use than others. But however you want to do it as long as you make sure you have a common language.

Here's a little bit about the swim lanes. Because you can have different providers, or different processes, at the same time in an organization. And you can try to map it out like this. So, things that take place at the same time. Or you can have the castle wall, with production times and wait times added up in the end. Have your wait times and your productive times.

So there are many ways, and there are some resources, where you can learn a whole lot more about this.

**GUEST** Can I say one more thing? When you do a value stream map, make sure that you bring it to the people doing the work to get their validation. Say, did I leave anything out, did I forget anything. Because oftentimes, you miss something. And they could say, oh, but you forgot that we do this. And I think that's really important, because then it gets them to buy into what you're doing, as well.

**GUEST** And even more strongly, you should have those people participating in the creating of the value stream map.  
**SPEAKER 3:**

**PROFESSOR:** That's actually what we do at BI. The ones doing the processes, and it's often from different provider groups, we involve them, we invite them, and we help them come up with this.



**GUEST** And then post them on the floor, so they can see them and they comment.

**SPEAKER 2:**

**PROFESSOR:** A good technique for all of these things that you do is, take pictures of these things, and you can post them or you can email them out to people, and say, this is what we found, please give us if you have any comments.

**GUEST** This is also a really good link between administration and front line workers, because I know in most hospitals,

**SPEAKER 2:** the administrators take turns walking around to visit the floors. And a lot of them are not clinical, might be the CFO or something. They come around, they go, how are you doing today, do you need anything, how are you doing today, do you need anything?

But if you have a value stream map posted, they can go to that map and you can discuss what you're working on together. And it just brings it to a different level. We call it Board Walks. Give them something to look at.

**GUEST** And the same is true in an engineering environment. Not just health care.

**SPEAKER 4:**

**GUEST** Absolutely.

**SPEAKER 2:**

**PROFESSOR:** And for health care, if you dare, go and find a patient who's arriving to your emergency department, to your area of work, wherever that may be. Follow that patient. If you're a phlebotomist, go find a patient registering for their blood draw. Follow them the whole way through, OK. Take a chill pill before you do it, because at least in my field, in the emergency department, I've tried. And I think IHI calls it "The Walk Of Shame".

And it really is. But it is important, because otherwise you will not understand. Most of us, I mean, we have different ways into the health care system. Again that is my perspective. So let's be honest, my wait time in my own emergency department is probably not going to be the same as somebody else's.

And another thing is, I don't have the same need to frequent an emergency department, right. There are things I can just fix myself. But go, find a patient, ask them politely if you can follow them for their journey. And then stick with it, take notes, bring your stopwatch.