Value Stream Mapping Basics

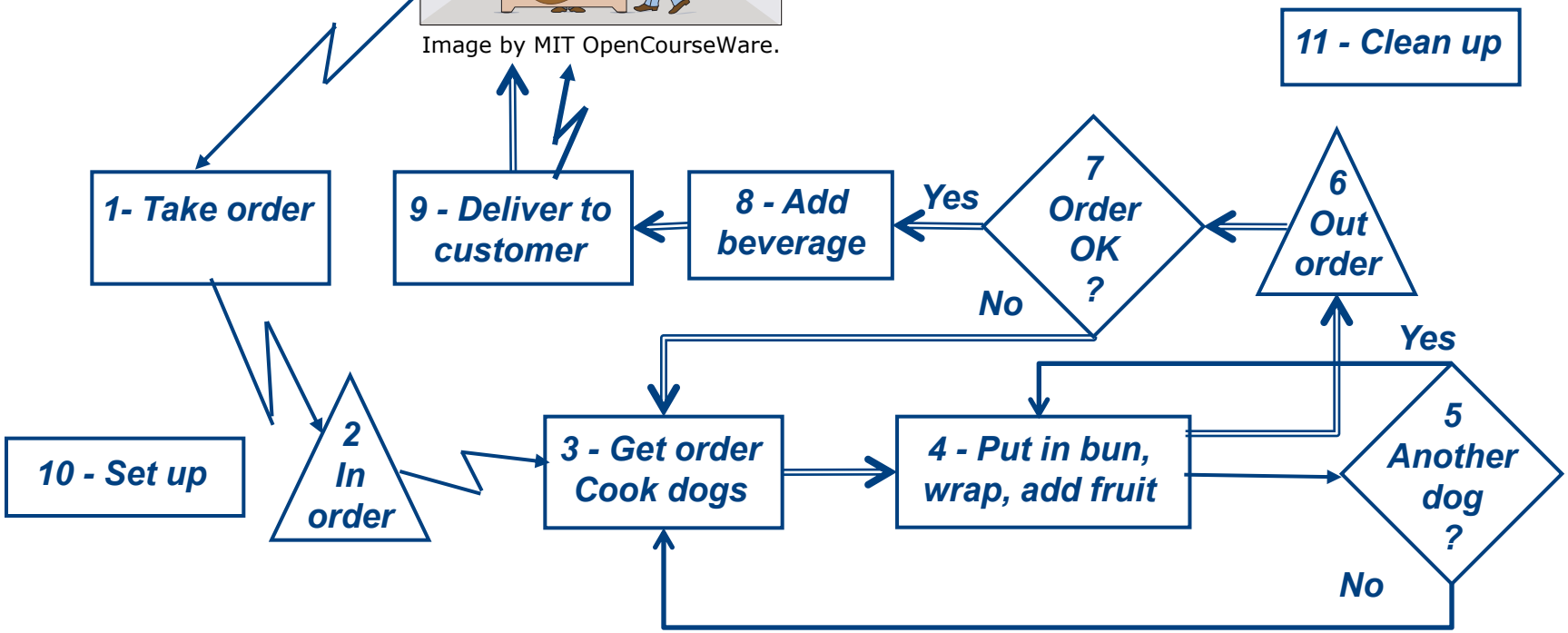
Learning Objectives

At the end of this module, you will be able to:

- **Sketch a basic value stream map**
- **Demonstrate basic value stream analysis**
- **Recognize steps for process improvement using value stream mapping and analysis**

Hot Dog Stand Process Map

Image by MIT OpenCourseWare.



How can Sasha and Andy improve their productivity to meet growing customer demand?

Five Lean Thinking Fundamentals

- **Specify *value*: Value is defined by customer in terms of specific products and services**
- **Identify the *value stream*: Map out all end-to-end linked actions, processes and functions necessary for transforming inputs to outputs to identify and eliminate waste**
- **Make value *flow* continuously: Having eliminated waste, make remaining value-creating steps "flow"**
- **Let customers *pull* value: Customer's "pull" cascades all the way back to the lowest level supplier, enabling just-in-time production**
- **Pursue *perfection*: Pursue continuous process of improvement striving for perfection**

Ref: James Womack and Daniel T. Jones, Lean Thinking (New York: Simon & Schuster, 1996).

Value Stream Map (VSM)

- A tool used to improve a process by identifying added value and eliminating waste
- A process map that follows the *value creation process*
  - "strap yourself to the product (or service) and see where you go"
- A process map with *data* added
  - Times: processing, wait, cycle
  - Quality: number of rejects
  - Inventory
  - Resources
    - Number of people
    - Space
    - Distance traveled
  - Whatever else is useful for analyzing the process

Steps for Creating a VSM

1. Define customer value and the process
   - "Walk" the process to identify tasks and flows
   - Identify value-added and waste process steps
2. Create the "current state" VSM
   - Gather data on resources, time, quality for each step
3. Analyze map to determine opportunities for improvement
   - Identify bottlenecks and other flow impediments
   - Brainstorm actions to eliminate waste and add value
4. Create a "future-state" map to visualize the desired and realistic next state
5. Create action plans to move toward future state

Step 1: S&A Customer Value and Process Map

Current Demand
50 customers
100 hot dogs

Image by MIT OpenCourseWare.

Customer Value
Good food
Faster service

11 - Clean up

1- Take order

9 - Deliver to customer

8 - Add beverage

Yes

7 Order OK ?

No

6 Out order

Yes

10 - Set up

2 In order

3 - Get order Cook dogs

4 - Put in bun, wrap, add fruit

5 Another dog ?

No

This process map follows the value creation process ✔

Value/waste assessed at each process step ✔

Step 2: Add Data

Image by MIT OpenCourseWare.

T = 60 sec
Qual = 100%

T = 30 sec
Qual = 100%

T = 10 sec
Qual = 100%

T = 11 sec
Qual = 90%

T = 48 sec
Qual = 100%

T = 33 sec

1- Take order

9 - Deliver to customer

8 - Add beverage

7 Order OK ?

6 Out order

11 - Clean up

Yes

No – 10%

Yes

10 - Set up

2 In order

3 - Get order Cook dogs

4 - Put in bun, wrap, add fruit

5 Another dog ?

No

T = 48 sec
Qual = 100%

T = 30 sec

T = 110 sec
Qual = 100%

T = 44 sec
Qual = 100%

T = 22 sec

Display of relevant data completes basic VSM

Images by MIT OpenCourseWare.

S&A Takt And Cycle Times

Current demand
50 customers

Open from 10AM - 2PM

$$\text{Takt time} = \frac{\text{Available time}}{\text{Customer demand}} = \frac{4\text{hrs} \times 60\text{min/hr}}{50 \text{ customers}} = 4.8\text{min} = 288 \text{ sec}$$

Cycle time (summed from previous data) = 7.4 min = 446 sec

Valid alternate calculation –
assume setup/cleanup is done "when things are slow"

10 - Set up

11 - Clean up

$$\text{Takt time} = \frac{\text{Available time}}{\text{Customer demand}} = \frac{4\text{hrs} \times 50\text{min/hr}}{50 \text{ customers}} = 4.0\text{min} = 240 \text{ sec}$$

Cycle time (excluding set up & clean up) = 5.8 min = 350 sec

Cycle time > takt time, but two workers – can demand be met?

Step 3: Value Stream Analysis

Sasha

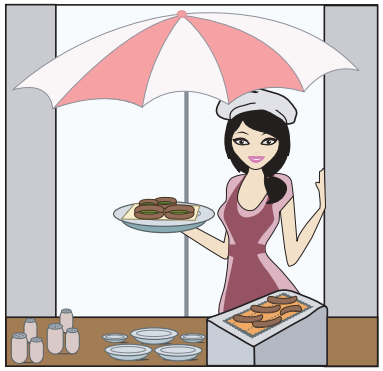


Image by MIT OpenCourseWare.

Image by MIT OpenCourseWare.

Andy

- With your team, take 15 minutes to
  - Calculate the total
    - Value added time
    - Non value added time
    - Wait time
  - Calculate the total "touch time" that Sasha and Andy spend on a single order
- Be ready to report your answers to the class

Utilization and Capacity

VAT is only slightly over 50% ⇒ Opportunities for improvement

Available time = 4 hours = 240 min

Worktime: Touch time per order X number of orders
Sasha's tasks:____/60 min X 50 cust. = _____ min
Andy's tasks: ____/60 min X 50 cust = _____ min

Utilization: Worktime / time available
Sasha's: (_____min / 240 min) X 100% = ____%
Andy's: (_____min / 240 min) X 100% = ____%

Capacity: Time available / touch time per order
Andy working at 100% = (240min X 60) / _____sec = ___

Utilization and Capacity

VAT is only slightly over 50% ⇒ Opportunities for improvement

Available time = 4 hours = 240 min

Worktime: Touch time per order X number of orders
Sasha's tasks: 159 /60 min X 50 cust. = 133 min
Andy's tasks: 224 /60 min X 50 cust = 187 min

Utilization: Worktime / time available
Sasha's: (133 min / 240 min) X 100% = 55 %
Andy's: (187 min / 240 min) X 100% = 78 %

Capacity: Time available / touch time per order
Andy working at 100% = (240min X 60) / 224 sec = 64

We will consider complications like varying orders or irregularly spaced customers in the Variation Module

Summary - S&A Value Stream Analysis (VSA)

- Current production (50 customers) is a little below current capacity (64 customers) of Andy and Sasha
  - Process improvement needed to meet growing demand
- Andy and Sasha are both underutilized
  - But utilization is not balanced between them
- Cycle time of 7.43 min per customer (or even 5.8 min) too long
  - Should be able to shorten cycle time to meet demands of customers for faster service

Bottom Line

Sasha and Andy should implement process improvement for week 3 to meet growing demand!

Improvement Brainstorm

Sasha

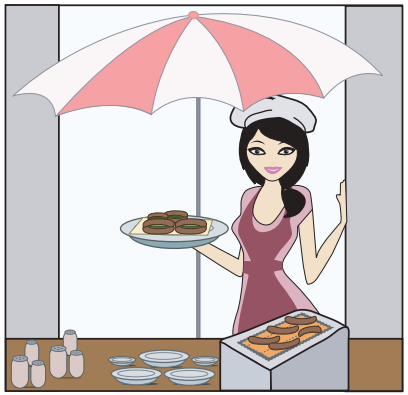


Image by MIT OpenCourseWare.

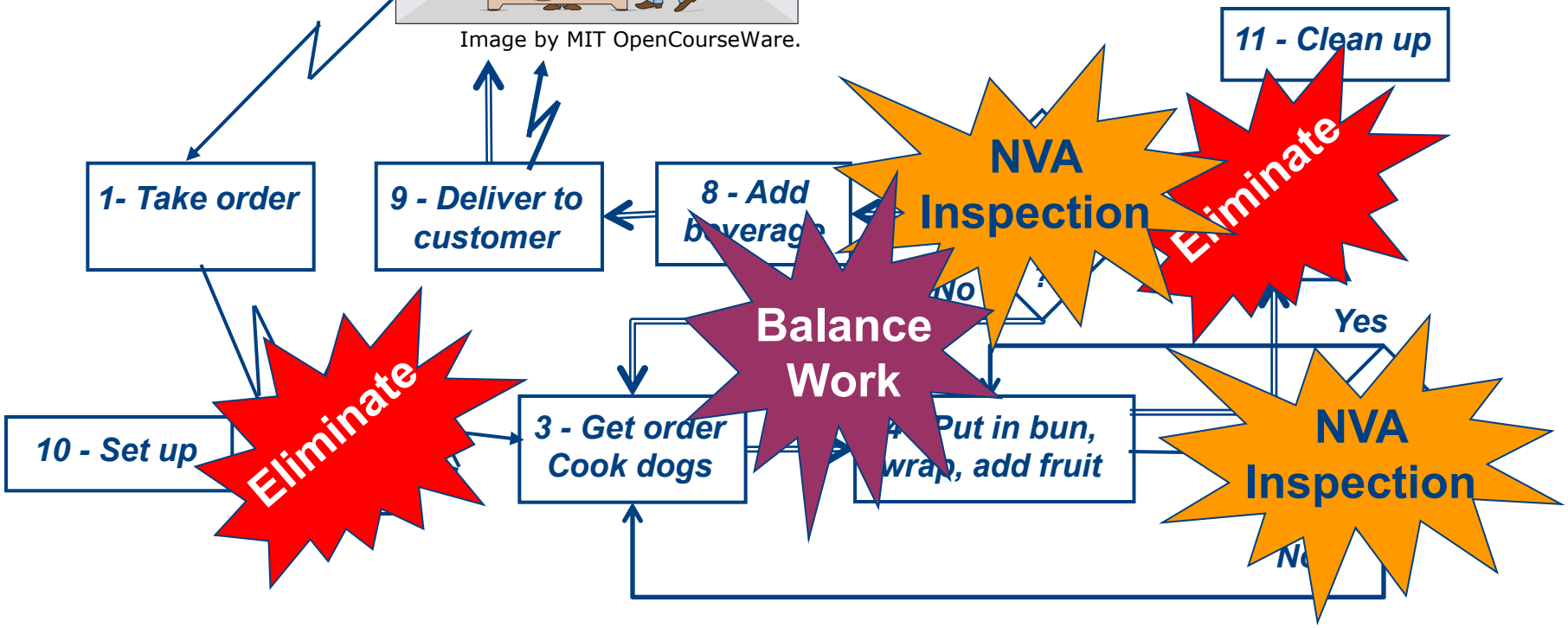
Image by MIT OpenCourseWare.

Andy

- **Help Sasha and Andy figure what to improve**
  - **How can utilization be improved?**
  - **How can cycle time be reduced?**
  - **What has to be done to serve 75 customers?**
  - **What has to be done to serve 100 customers?**

Brainstorm Bursts

Image by MIT OpenCourseWare.



Steps for Creating a VSM

1. Define customer value
2. Create a "current state" map
   - "Walk" the process to identify tasks and flows
   - Gather data on resources, time, quality for each
3. Analyze map to determine opportunities for improvement
   - Identify value-added and waste
   - Brainstorm actions to eliminate waste and add value
4. **Create "future-state" map to visualize the desired state**
5. **Create action plans to move towards future-state**

Why is VSM a Useful Tool?

- Helps visualize interactions and flows
- Shows linkages between information and product flows
- Provides a common language for talking about a process
- Helps to identify:
  - the constraint(s) - any resource whose capacity is less than customer demand;
  - wastes as well as their sources

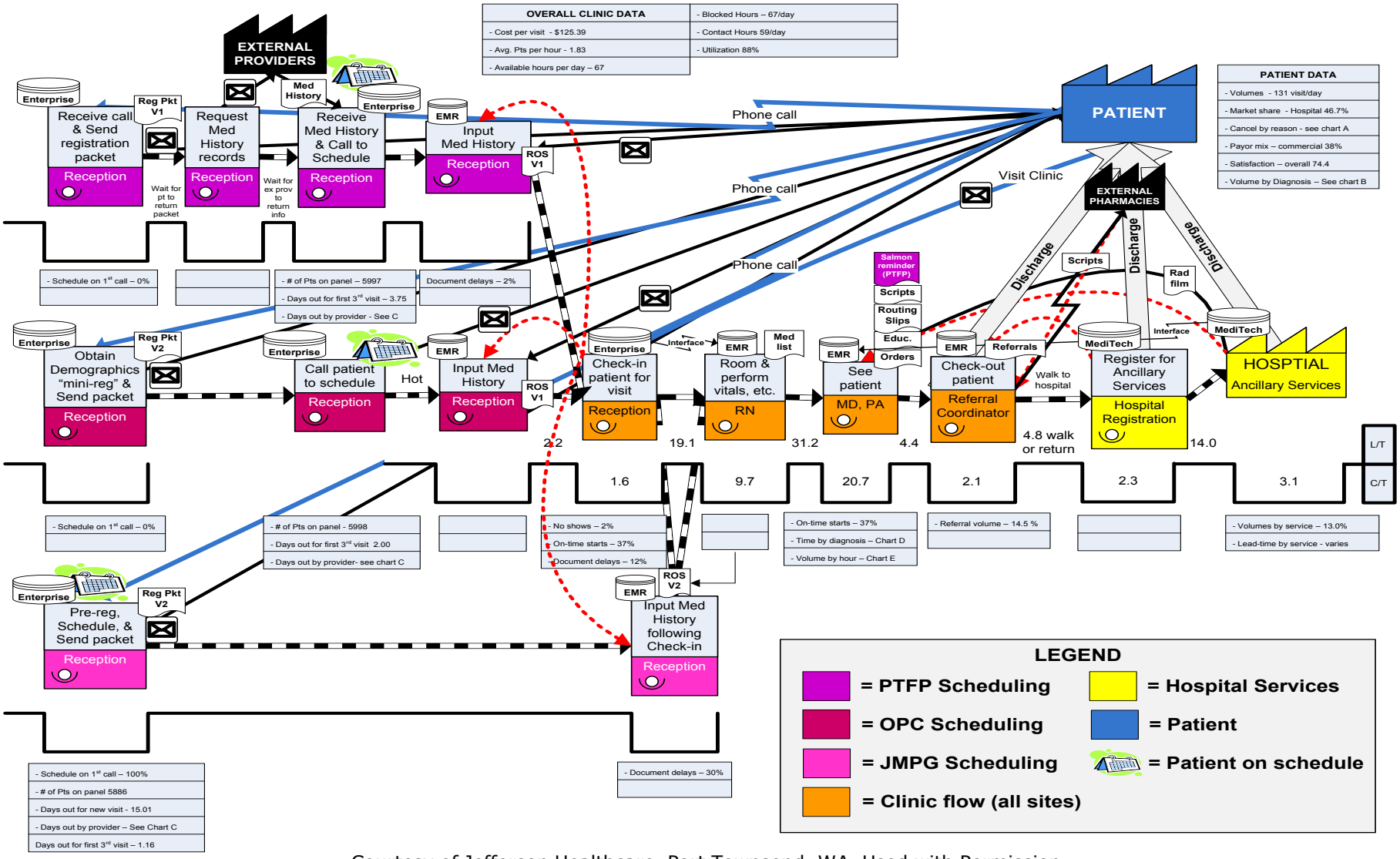
Adapted from: M. Rother and J. Shook, Learning to See, Lean Enterprise Institute, 1998

Tips for Creating a VSM

- Involve entire team
- Actually walk the process - follow the material and information through the process, starting at the beginning
- Use Post-it notes and butcher paper
- Use symbols or icons that are meaningful to the process but common enough to be understood by all involved

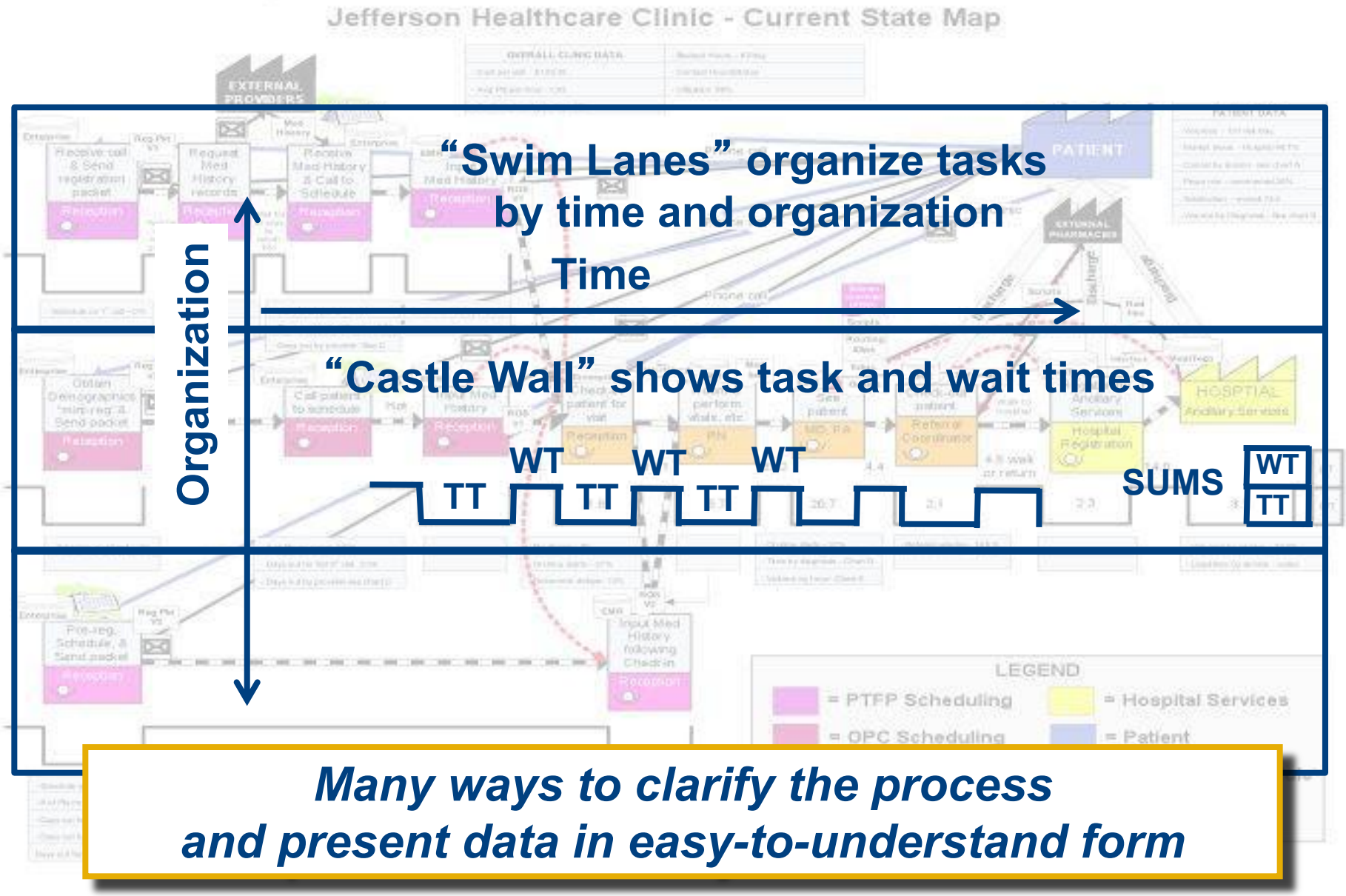
"Industrial Strength" Example

Jefferson Healthcare Clinic - Current State Map



Courtesy of Jefferson Healthcare, Port Townsend, WA. Used with Permission.

Additional Graphic Elements



Many ways to clarify the process and present data in easy-to-understand form

Courtesy of Jefferson Healthcare, Port Townsend, WA. Used with Permission.

More Information

Courtesy of Lean Enterprise Institute. Used with permission.

Reading List

Jimmerson, C., Value Stream Mapping for Healthcare Made Easy, Productivity Press, New York, NY, 2010

McManus, H., "Product Development Value Stream Mapping (PDVSM Manual)", Release 1.0, Sept 2005. Lean Advancement Initiative.

Rother, M. and Shook, J. *Learning to See*, v1.2, The Lean Enterprise Institute, Cambridge, MA June 1999

Acknowledgements

Contributors

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