Process Modeling Techniques Job Aid

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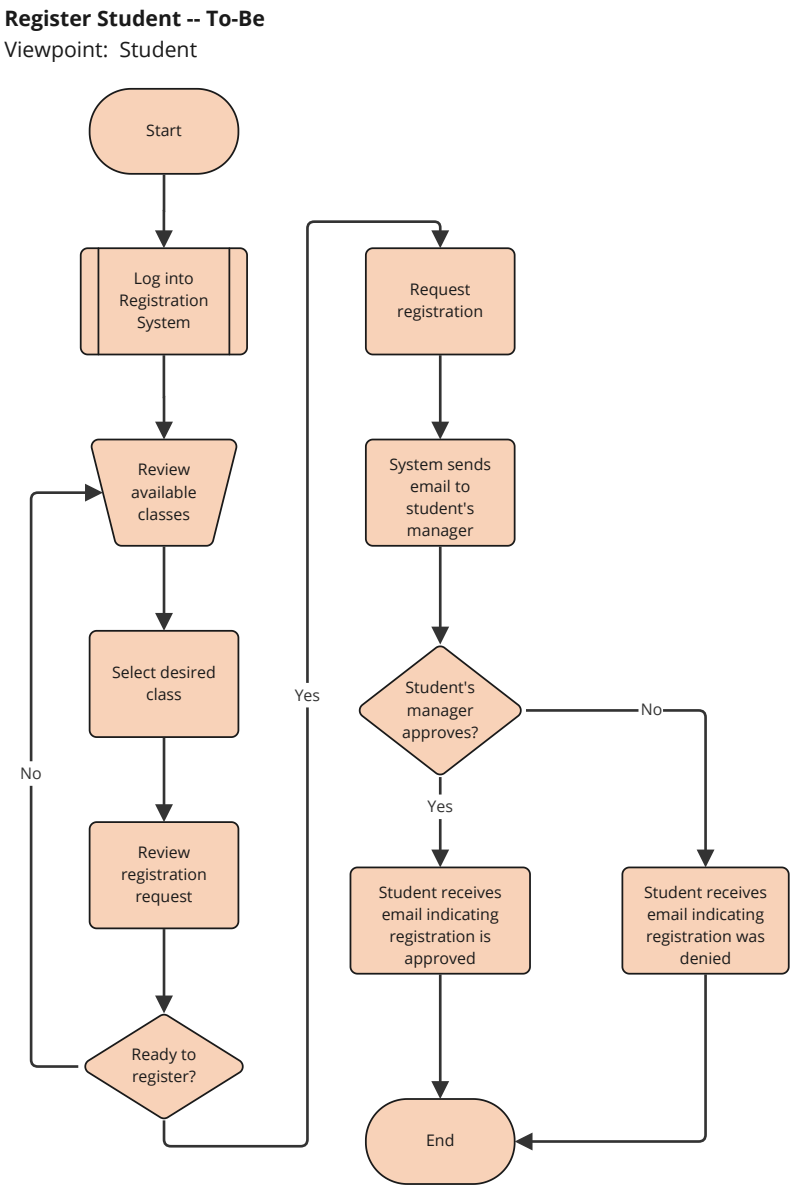
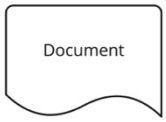
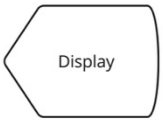
ANSI Standard Flowcharts

One of the most well-established diagrams used for process modeling is the American National Standards Institute (ANSI) standard flowchart.

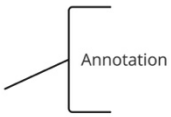
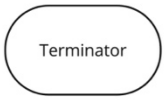
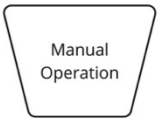
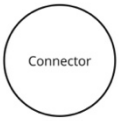
Example:



Common symbols used in ANSI flowcharts:

Diagram Component	Symbol
Activities – rectangles that represent business tasks	
Flow of control – arrows from one activity to another	
Documents – a shape with a torn bottom half that represents a form, letter, report, fax, or other information presented on paper	
Decision points – diamond showing a question or condition and the appropriate branching. Arrows from either side of diamond show results.	
Communication link – lightning bolt (interrupted arrow) to represent the transmission of information	
Display - this represents a screen interface	

ANSI flowchart symbols (cont.):

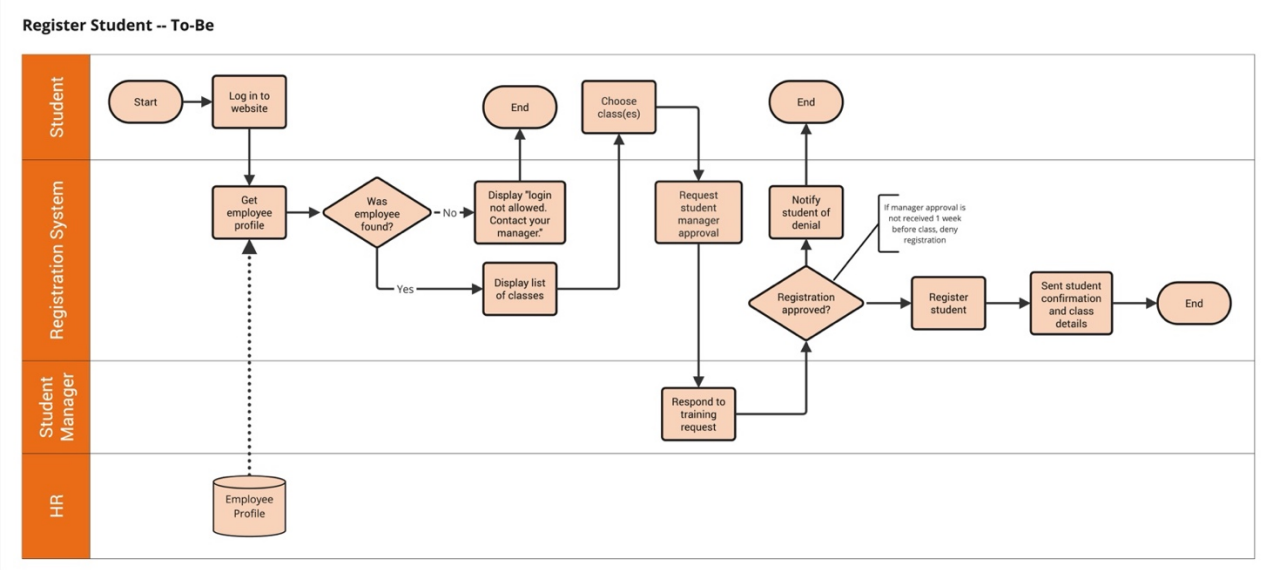
Diagram Component	Symbol
Annotation – A textual description that can be connected to any other symbol on the flowchart to give the reader additional information.	
Terminator – an oval shape signifies the beginning and end of the sequence of tasks	
Database – electronic storage of information	
Pre-defined process – any outside system or process that will not be detailed on the current diagram. It may be represented on a flowchart of its own.	
Manual process – any business task that is not automated	
Off page connector	
On page connector	

Swim Lane/Functional Diagrams

Functional Diagrams (also referred to as *swim lanes*) show activities grouped by the same functional area or actor.

These diagrams add a user role to a business process.

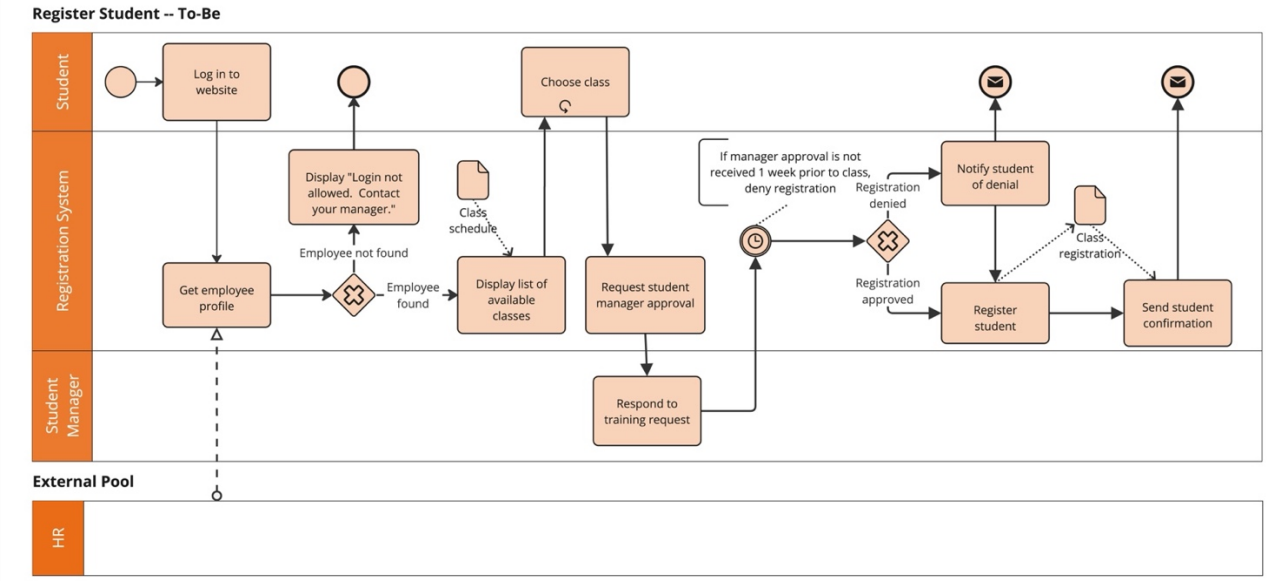
Example: Swimlane Diagram



BPMN Process Models

A Business Process Modeling Notation (*BPMN*) process model is a visual depiction of the flow or sequence of a process from the business perspective.

Example: BPMN flowchart



Common symbols used in BPMN process models:

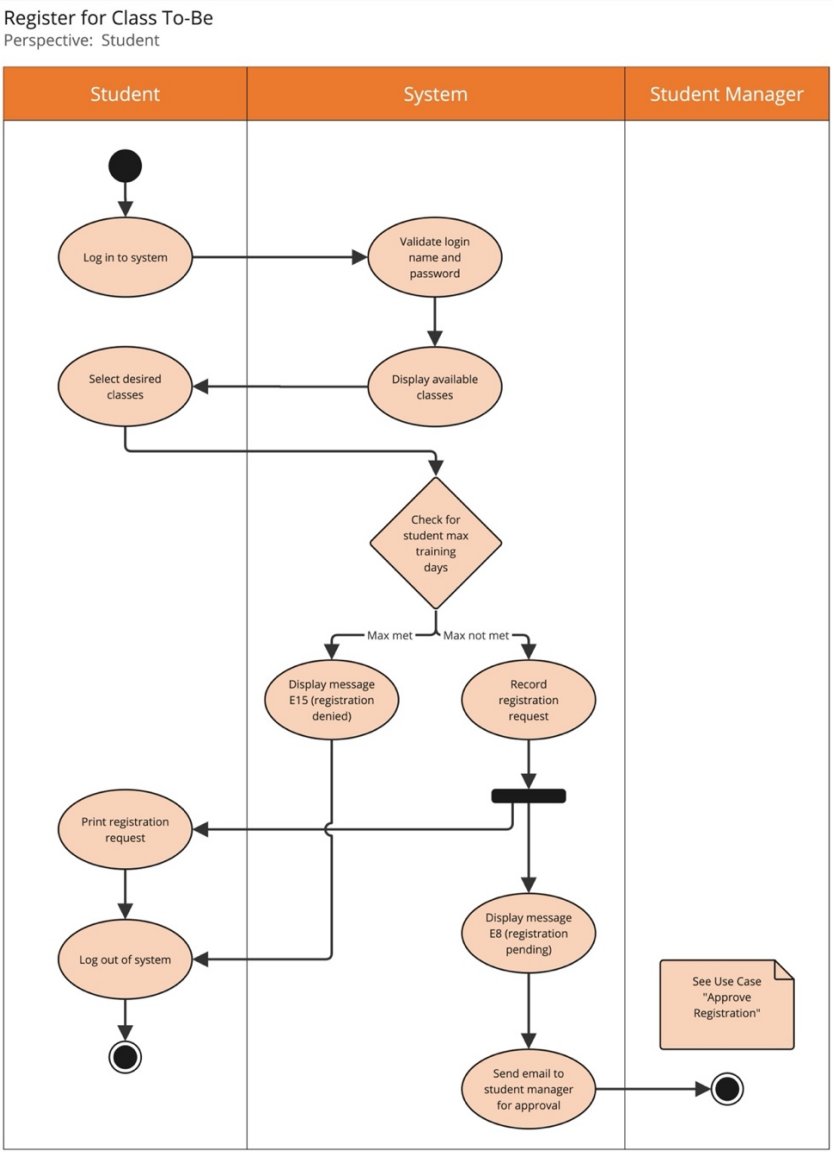
Diagram Component	Symbol
Activities: roundtangles that represent business tasks	
Sub-processes: roundtangles with plus sign that represent composite processes	
Sequence flow: solid arrows showing the order in which tasks are performed	
Message flow: dashed line arrows showing information flow between two process participants	
Association: dotted line showing a related artifact (may use an arrowhead)	
Simple start event: open circle indicating the beginning of the process. Symbols inside the circle indicate the cause of the event. Start events cannot have incoming flows.	
Simple end event: circle indicating the end of a process	
Terminate all processes	
Intermediate event: circle that shows that something happens after a process has started and before it has ended	
Gateway: a diamond showing branching, forking, merging, and joining of sequence paths. Symbols inside the diamond indicate the type of behavior.	

UML Activity Diagrams

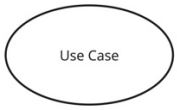
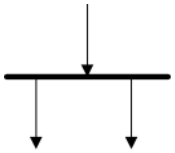
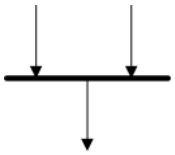
A diagram similar in function to an ANSI flowchart is the Unified Modeling Language (UML) activity diagram.

UML activity diagrams may be used for both manual and automated processes.

Example: UML Activity Diagram



Common symbols used in UML Activity Diagrams:

Diagram Component	Symbol
Initial state – This is the starting point of the activity diagram and coincides with the preconditions described in the path.	
Use Case – Tasks done by the actor or by the system (ovals or rectangles)	
Flows – Arrows showing transitions from one activity to another	
Decision node – Each branch should have a Condition.	
Conditions – Square brackets containing text next to an activity or decision point.	[place order selected]
Fork – Point at which the flow breaks into two or more parallel paths	
Join – Point at which the paths come back together. Forks and Joins should be balanced.	
Final state – The ending point of the diagram coincides with the scenario's post condition and is shown with a bull's eye	

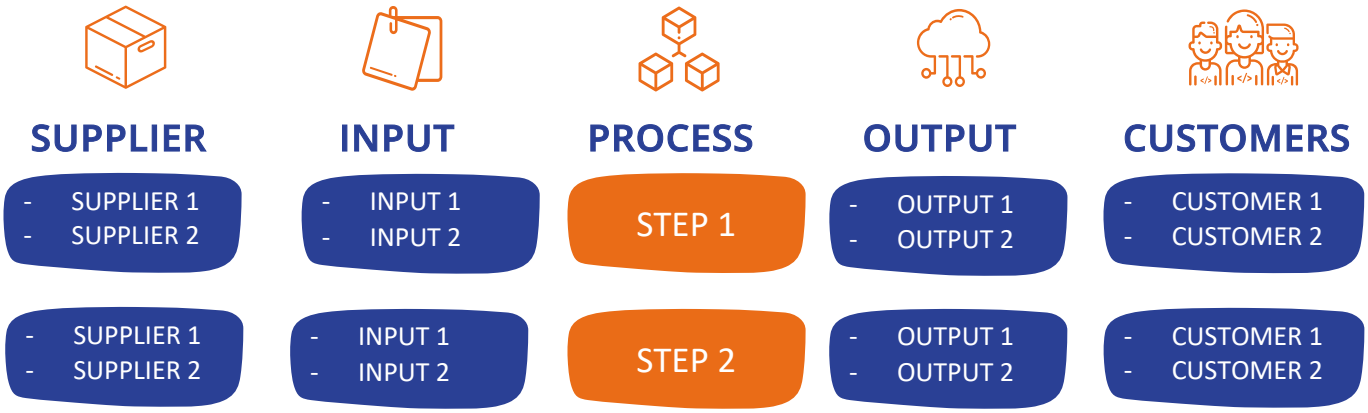
SIPOC Diagrams

Six Sigma uses a *Supplier – Input – Process – Output – Customer* (SIPOC) diagram to evaluate processes.

Processes transform inputs into higher value outputs. The outputs of a process should have higher value than the inputs. If not, the process is not adding business value.

This diagram is generally used as a communication tool for the project team to discuss processes with executive management.

SIPOC format:

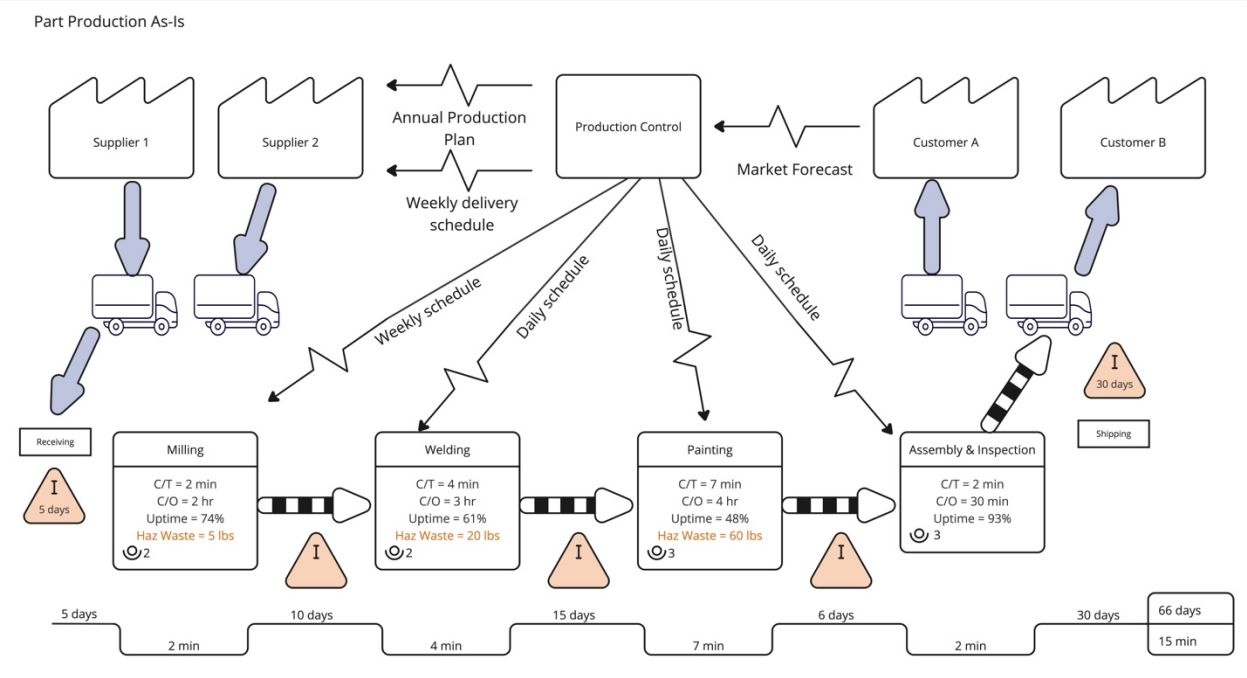


Value Stream Mapping

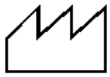
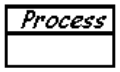
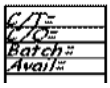
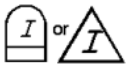
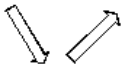
Value Stream Mapping (VSM) is a visual means to depict and improve the flow of a process, as well as the information that controls the flow of materials through the process.

It is a tool for identifying the inherent waste and losses within an operation.

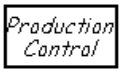
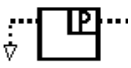
Example:



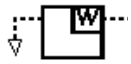
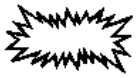
Common symbols used Value Stream Maps:

Diagram Component	Symbol
Customer/Supplier Icon: represents the Supplier when in the upper left, customer when in the upper right, the usual end point for material	
Dedicated Process flow Icon: a process, operation, machine or department, through which material flows. It represents one department with a continuous, internal fixed flow.	
Shared Process Icon: a process, operation, department or workcenter that other value stream families share.	
Data Box Icon: it goes under other icons that have significant information/data required for analyzing and observing the system.	
Workcell Icon: indicates that multiple processes are integrated in a manufacturing workcell.	
Inventory Icons: show inventory between two processes	
Shipments Icon: represents movement of raw materials from suppliers to the Receiving dock/s of the factory. Or, the movement of finished goods from the Shipping dock/s of the factory to the customers	
Push Arrow Icon: represents the “pushing” of material from one process to the next process.	
Supermarket Icon: an inventory “supermarket” (kanban stockpoint).	
Material Pull Icon: supermarkets connect to downstream processes with this “Pull” icon that indicates physical removal.	

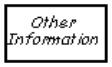
Common symbols used Value Stream Maps (cont.):

Diagram Component	Symbol
FIFO Lane Icon: First-In-First-Out inventory. Use this icon when processes are connected with a FIFO system that limits input.	
Safety Stock Icon: represents an inventory "hedge" (or safety stock) against problems such as downtime, to protect the system against sudden fluctuations in customer orders or system failures.	
External Shipment Icon: shipments from suppliers or to customers using external transport	
Production Control Icon: This box represents a central production scheduling or control department, person or operation.	
Manual Info Icon: A straight, thin arrow shows general flow of information from memos, reports, or conversation. Frequency and other notes may be relevant.	
Electronic Info Icon: This wiggle arrow represents electronic flow such as electronic data interchange (EDI), the Internet, Intranets, LANs (local area network), WANs (wide area network). You may indicate the frequency of information/data interchange, the type of media used ex. fax, phone, etc. and the type of data exchanged.	
Production Kanban Icon: This icon triggers production of a pre-defined number of parts. It signals a supplying process to provide parts to a downstream process.	

Common symbols used Value Stream Maps (cont.):

Diagram Component	Symbol
Withdrawal Kanban Icon: This icon represents a card or device that instructs a material handler to transfer parts from a supermarket to the receiving process. The material handler (or operator) goes to the supermarket and withdraws the necessary items.	
Signal Kanban Icon: used whenever the on-hand inventory levels in the supermarket between two processes drops to a trigger or minimum point. It is also referred as “one-per-batch” kanban.	
Kanban Post Icon: a location where kanban signals reside for pickup. Often used with two-card systems to exchange withdrawal and production kanban.	
Sequenced Pull Icon: represents a pull system that gives instruction to subassembly processes to produce a predetermined type and quantity of product, typically one unit, without using a supermarket.	
Load Leveling Icon: a tool to batch kanbans in order to level the production volume and mix over a period of time.	
MRP/ERP Icon: scheduling using MRP/ERP or other centralized systems.	
Go See Icon: gathering of information through visual means.	
Verbal Information Icon: represents verbal or personal information flow.	
Kaizen Burst Icon: used to highlight improvement needs and plan kaizen workshops at specific processes that are critical to achieving the Future State Map of the value stream.	

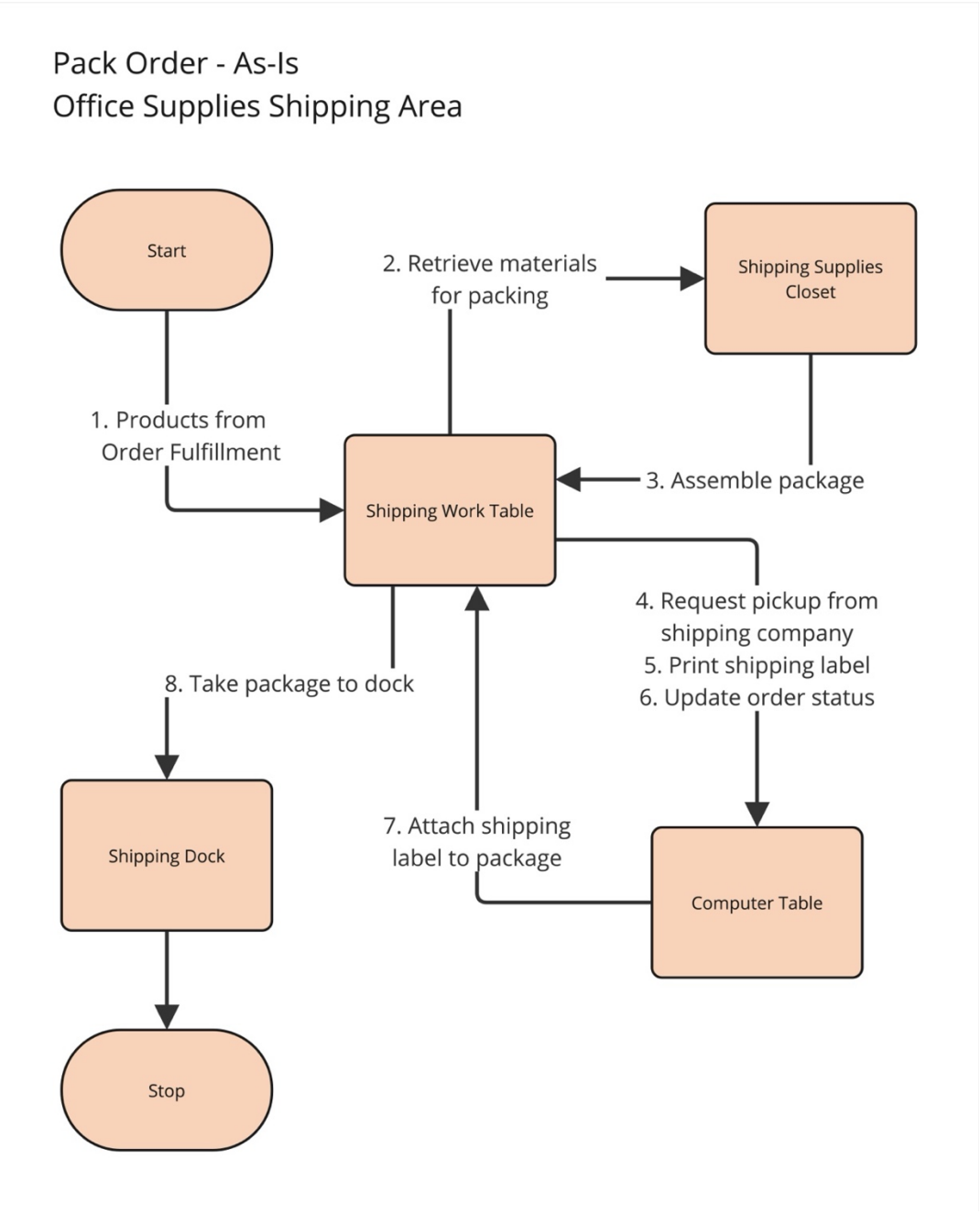
Common symbols used Value Stream Maps (cont.):

Diagram Component	Symbol
Operator Icon: represents an operator. It shows the number of operators required to process the VSM family at a particular workstation.	
Other Icon: other useful or potentially useful information.	
Timeline Icon: shows value added times (Cycle Times) and nonvalue added (wait) times. Use this to calculate Lead Time and Total Cycle Time.	

Geographic Diagrams

Geographic diagrams use maps, floor plans or office layouts to show where work is accomplished.

Example:



Spaghetti Diagrams

Spaghetti diagrams use a continuous-flow line tracing the path of an item or activity between the physical locations in a process.

Example: