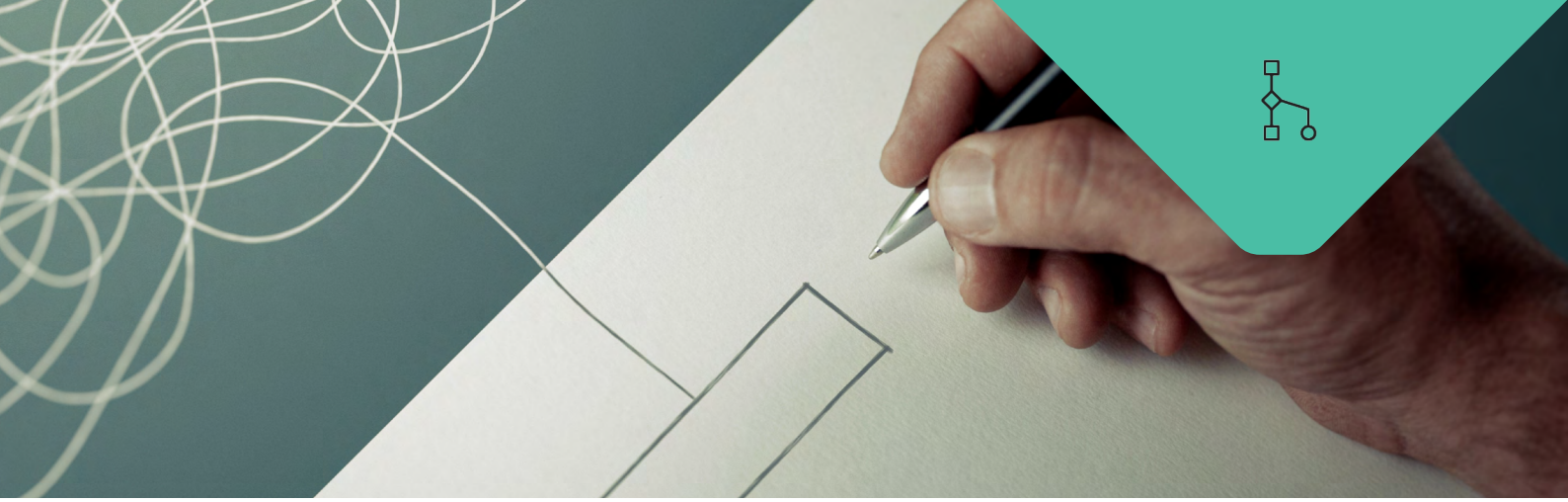


State Machine

Global e-commerce revenue reached 3.53 trillion USD in 2019*. It is not hard to imagine that big corporations and small businesses, which intend to grow, are all confronted with an incredible amount of data and need to execute e-commerce-related processes and tasks as effectively as possible. The biggest challenge is translating all the business needs into a coherent IT structure and ensures flawless collaboration. Our solution for this challenge is the introduction of the State Machine, which is heavily used by our customers. To show the versatility of States Machines we have included a case study of the Spryker customer Kapten & Son at the end of this document.

A State Machine, originating from mathematics, is a tool that helps you implement complex processes easily and map out different business workflows, allowing you to increase efficiency fast. It also enables developers to work productively and guarantees improvements throughout all departments, as well as the entire customer lifecycle.

How it Works

State Machines consists of a fixed number of states, transitions, and events that can all be defined by the company. The concept: an event triggers a transition from one state to another, starting from a predetermined initial state and ending with a final state with various states in between. An easy example of a process that can be mapped out with a state machine is order management.

Simply put, a State Machine reads a string of events, and changes or remains in its state.

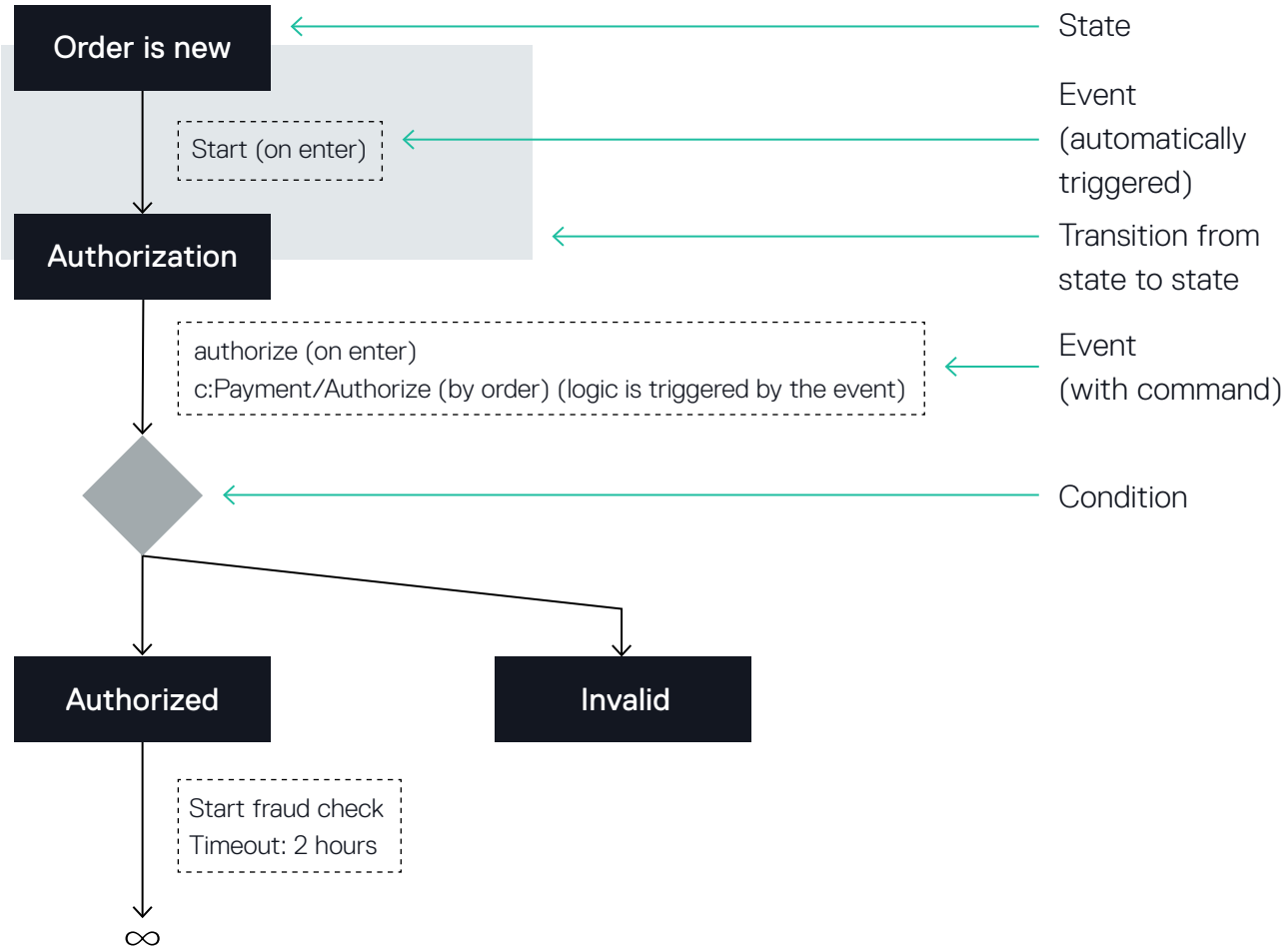
This methodology allows businesses to map out complex journeys and automates the process.

Key Benefit

Using State Machines to map out processes decreases the wasted time of managing complicated code by your development team. Developers can focus on one state at a time, always following the same language and rules, and avoiding complicated 'if...else' scenarios or so-called 'Spaghetti Code' to execute code based on condition.

*Statista 2019. 'Retail e-commerce sales worldwide from 2014 to 2023'

The Structure of the State Machine



State: Describes the current step of your process.

- **Order is new**
- **Authorization**
- **Authorized**
- **Invalid**

Transition: Is the connector between two states. It defines how and if a state changes from one to another. It is important to note that transitions are linear, so no state can be skipped.

- **The payment for the order that has just been placed is getting ready to be authorized.**

Event: The transition from one state to the other is triggered by an event. This can happen automatically, after a defined timeout period or by simply pressing a button in the backoffice.

- **One event is preparing the order for the authorization and the second event triggers the authorization.**

Conditions: Conditions can be added to the modeling process and can influence the behavior of the State Machine by enforcing certain alternative actions.

- **The condition is evaluated. If it returns true, the transition attached to the condition is executed (the State Machine will move to the Authorized state). Otherwise, it returns the state 'Invalid'.**

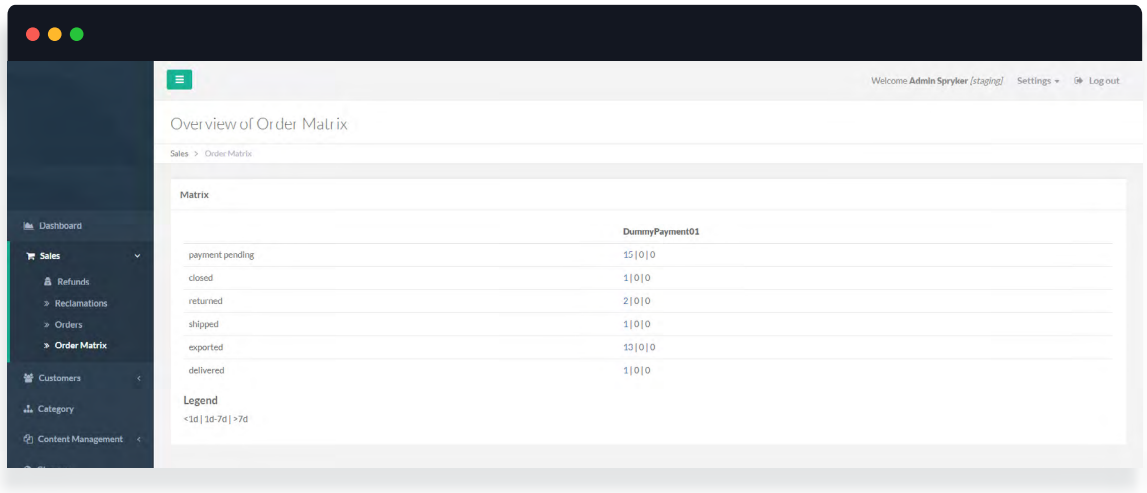
Commands: Commands are extra functionalities added to an event.

- **Sending an email while moving from one state to another one**
- **Communication with the payment service provider**

Visualization: Although the state machine is defined in an XML format, the complete progress is easily visualized, so everybody in the organization can fully comprehend the structure and participate.

Spryker Out-of-the-Box State Machine

No business can afford flawed processes when it comes to converting potential customers to paying customers, so there needs to be a functional order management process in place. State Machines can build processes that are powerful enough to meet all the requirements and allow for an automated order flow, which Spryker has done with its Order Management System (OMS). It has mapped out the entire order cycle - from placing your order with your desired items to authorizing payment and sending an email confirming your order. The entire lifecycle of your order is described in states and transitions.



In the back-end, the OMS provides a quick overview of all the orders and their current statuses taken directly from the State Machine. This allows you to see how many order items currently exist in each status and for how long they have been there. If orders are stuck in a certain state and are piling up, this is an indication the process needs to be refined. Due to the, easy-to-understand overview, every stakeholder involved can vet and improve the process. From this overview, you can easily dive deeper into the details per order and its status. Another clear benefit is that Customer Service is empowered to check orders and intervene by triggering transitions manually when necessary.

Apart from the Order Management System and its Matrix, the State Machine Module can be used in other contexts as well. Any entity that changes state based on a predefined process, can leverage the State Machine as an underlying process navigator.

Opportunities When Using State Machine

Simple automation of processes

State Machines can automate any business process, no matter the complexity. Non-technical stakeholders can give input on how processes should be modeled, because processes can be visualized and mapped out easily without going too deep into the technicalities of the code.

Stay flexible and adaptable in setting up your business logic

Once a State Machine process is in place, it is never stuck. Your team can edit and modify each portion of the process as much as needed. Only State Machines allow this kind of flexibility as traditional approaches only allow modification in fixed extension points. New action points, containing new states and transitions, can always be added and smaller State Machines can be easily used or reused.

Use an overview of states to optimize processes

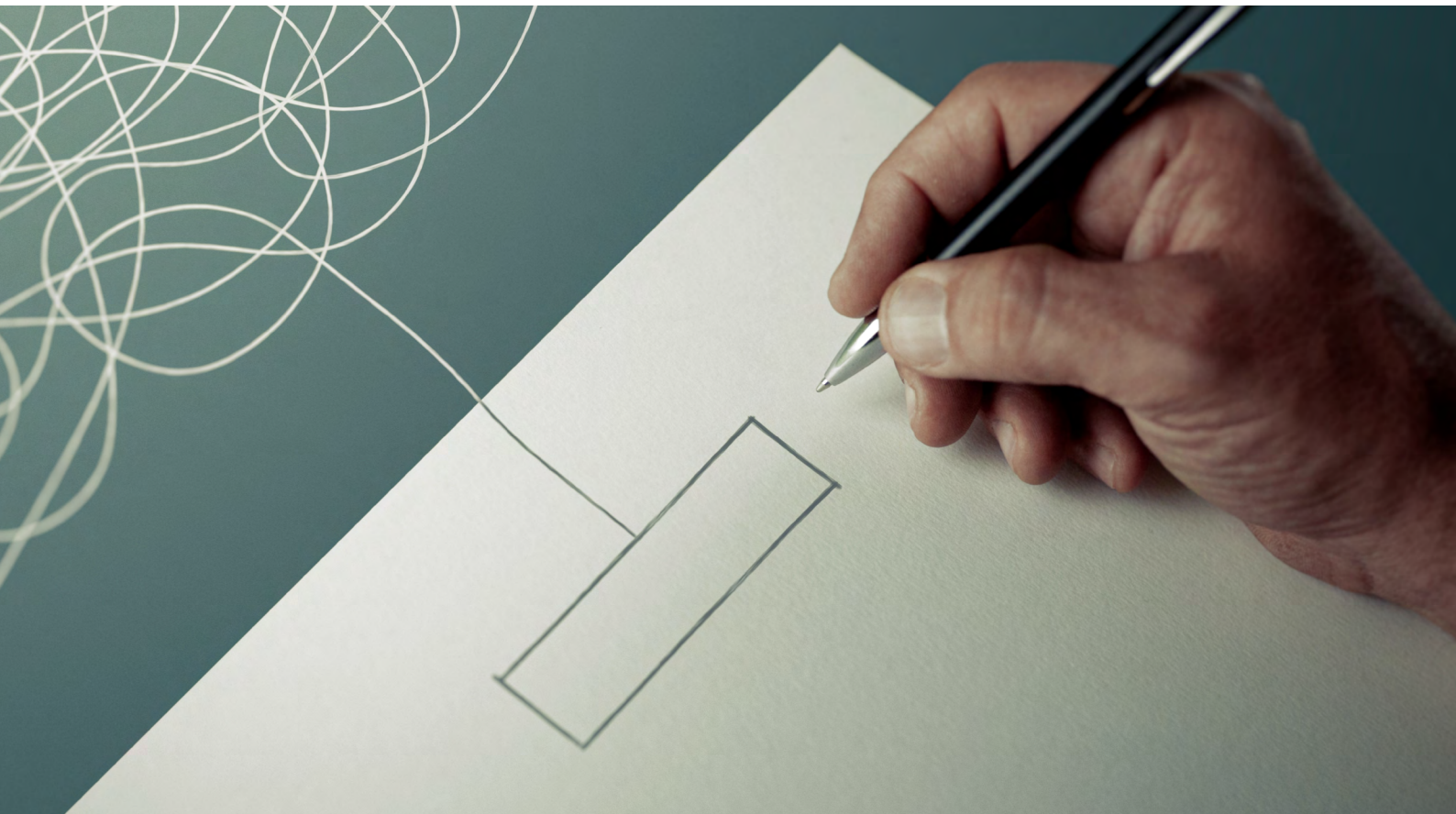
Investigate problems and find possible bottlenecks in processes and transactions, by implementing an overview in the back-end of all the states of your State Machine.

Save on resources by using our out-of-the-box State Machine

Spryker provides a State Machine that conceptualizes the order process. Use this State Machine as a starting point to quickly map out and implement your own processes with limited required resources.

State Machine technology benefits every department

Map the entire customer lifecycle throughout different departments. Simple implementations can automate typical department needs like checking credit worthiness or fraud checks and sending payment reminders via email. Even administrative tasks like uploading, checking and posting things like part lists can be taken care of.



Customer Case

Kapten & Son

Spryker customer **Kapten & Son** has implemented not only the default Order Management System which Spryker provides out-of-the-box, but has developed additional States Machines. Their State Machines are applied for asynchronous connections, or events that happen independent of the typical flow, in the front-end prompting scenarios where data has to be processed in additional systems, especially if related to orders.

Why is Kapten & Son implementing State Machines?

> *We see the big advantage in having one centralized system, in our case the back-end of Spryker Commerce OS, that showcases all the current states, even if the actual business logic is carried out in the front-end. Additionally, we have the opportunity to use State Machine Timeouts to trigger time-controlled processes. The asynchrony of the Spryker State Machine and the used queues allows easy and feasible scaling of the process."*
>
> - Stephan Backenköhler, CTO Kapten & Son

Kapten & Son uses State Machines in the following areas:

- ERP
- Order Fulfillment
- Import of Tracking Number
- CRM, in regard to Order status and Confirmation
- Newsletters
- Return processes

The variety of Kapten & Son use cases shows how versatile State Machines are. Implementing it now will help your business to leap forward and reap the benefits of improved performance and flexible processes.

Spryker

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