



## Edison: Predictive Analytics for Sales Order Fulfillment

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# Sales Order Fulfillment Process

## Issues Interrupting the Process

During sales order processing several issues may occur:

In Order Entry	In Supply	In Delivery	In Invoice	Process Step
Incomplete data	Purchasing issues	Shipping blocks	Accounting issues	Possible Issues
Delivery blocks	Manufact. issues	Incomplete data	Invoicing issues	
Credit blocks		Credit blocks		
Billing blocks		Shipping issues		
Delivery issues				
Unconfirmed quantities				

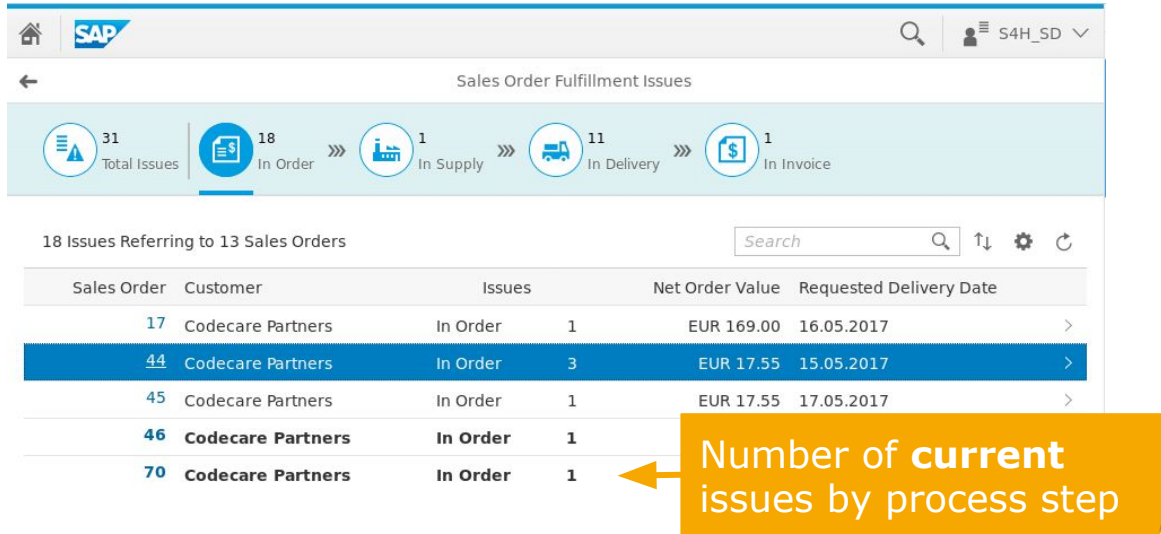
An issue usually halts the process and causes the delivery to be **delayed**.

# Sales Order Fulfillment Process

## Status Quo

### SAP's Sales Order Fulfillment Monitor (SOFM):

- SOFM allows for detection and categorization of current issues
- Employees then try to resolve current issues as fast as possible



➔ Solving issues after they have occurred is often **too late**

# Sales Order Fulfillment Process

## Our Vision



- Learn which fields and conditions caused issues by looking at **data of millions of historical sales orders**



- **Predict the expected delay** whenever a new sales order enters the system



- Display a list of the **most pressing expected issues**

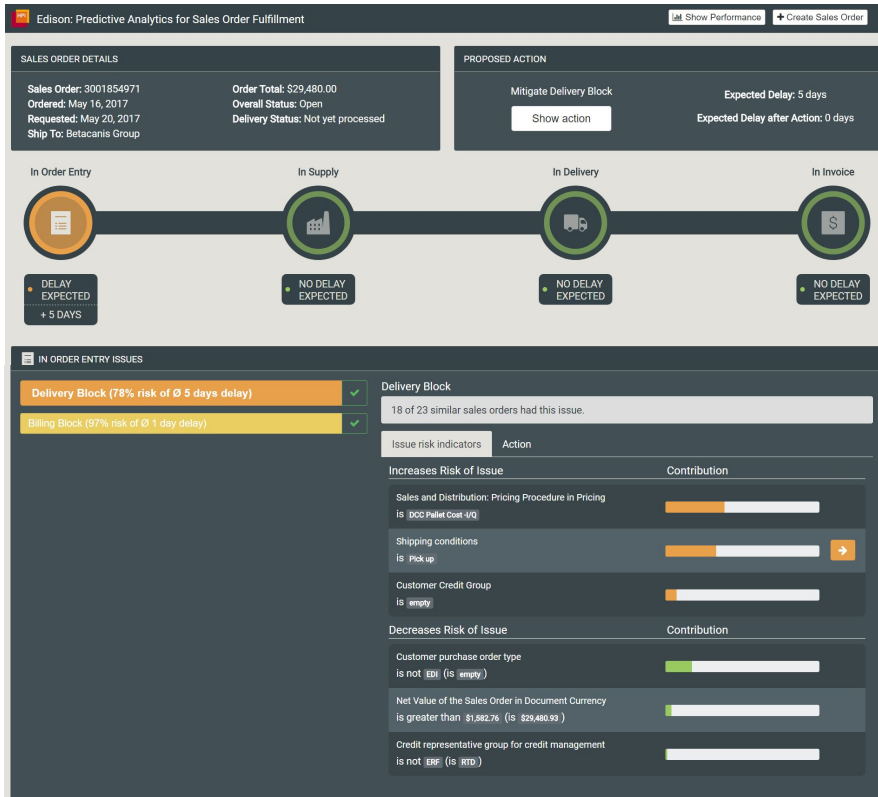


- Propose the most effective action to **mitigate an issue in advance**



- Resolving issues even before occurring **saves time and money and makes customers happy**

# Predictive Analytics for Order Fulfillment Prototype



**Most effective action** to mitigate issues in advance

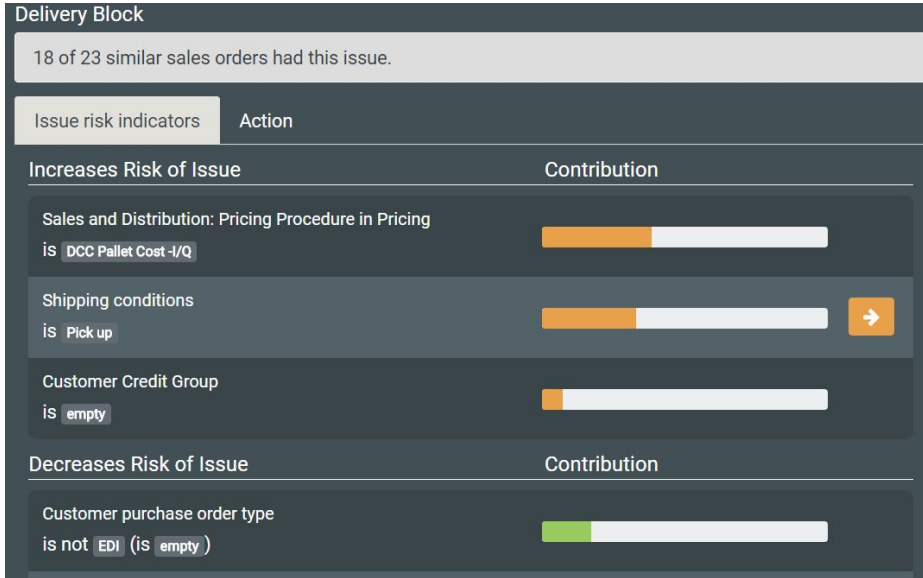
Process overview with expected delays by step

**Expected issues** of the currently selected process step and the data used to calculate risk percentages

Chart 5

# Predictive Analytics for Order Fulfillment

## Risk Indicators for Expected Issues



Indicating how many similar sales orders experienced the issue in the past

Sales order fields increasing the risk of an issue

Sales order fields decreasing the risk of an issue

# Machine Learning Techniques

## Predicting Issues based on Sales Order Information

### Decision Trees

- Binary classification, e.g., delivery block (SO02) or no delivery block
- New orders are classified based on historical data
- Find splits which lead to homogenous groups

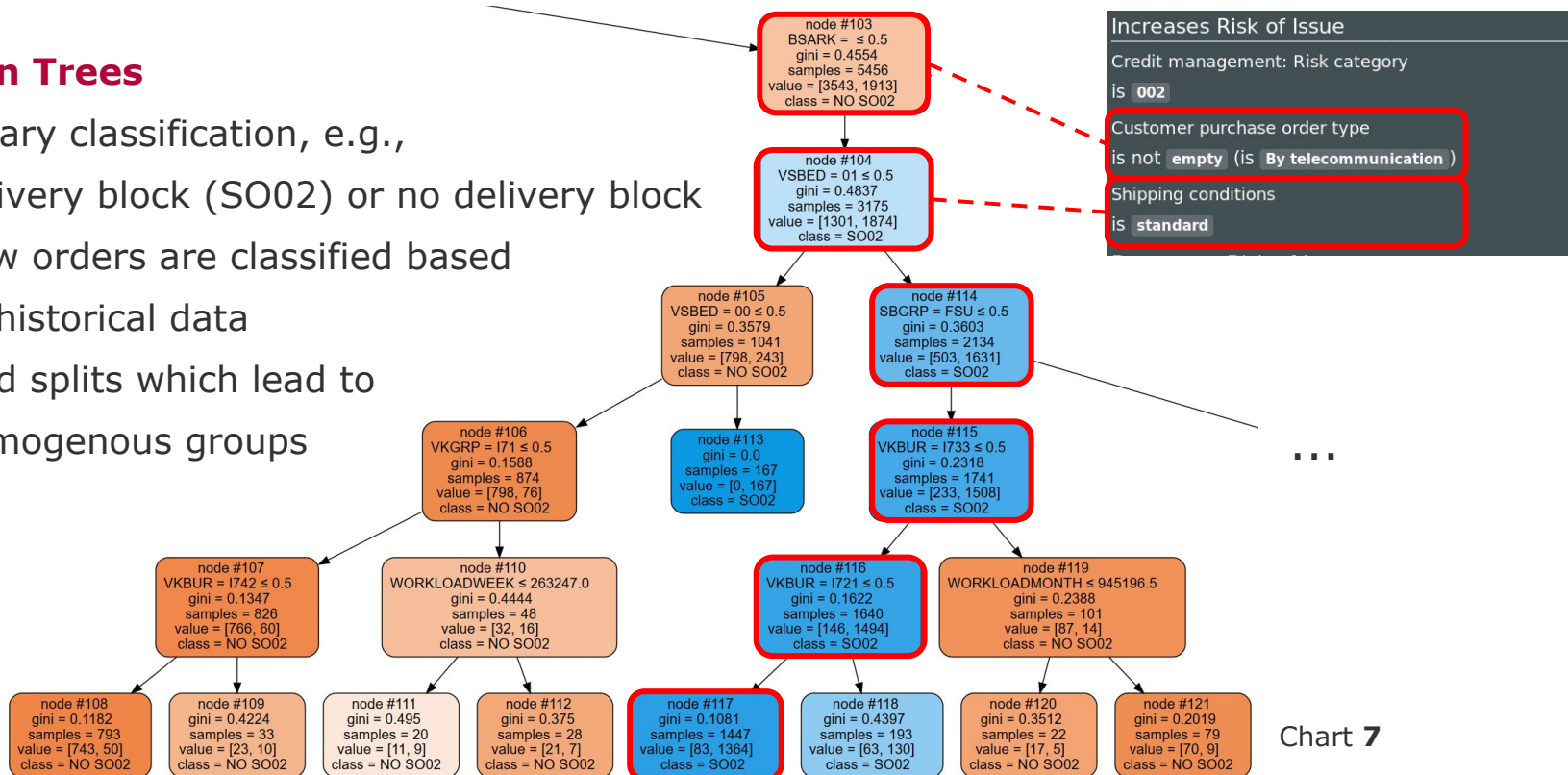
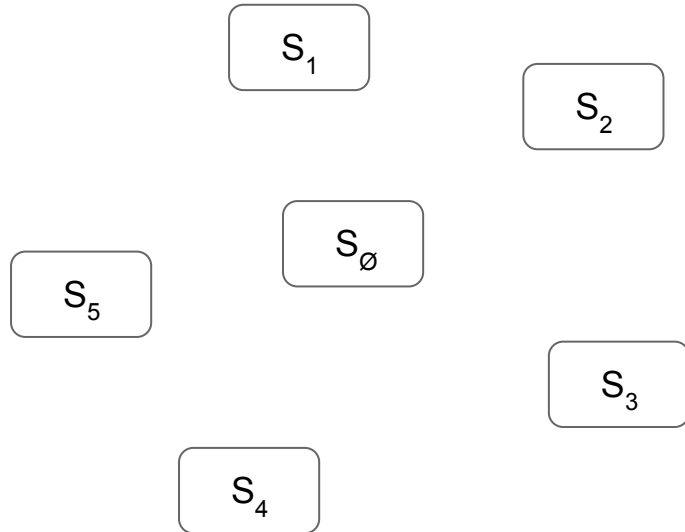


Chart 7

# Machine Learning Techniques

## Propose Most Effective Action



### Partially Observable Markov Decision Process (POMDP)

#### States:

Issues or issue combinations, e.g.,

$S_\emptyset$ : no issue

$S_1$ : {delivery block, billing block}

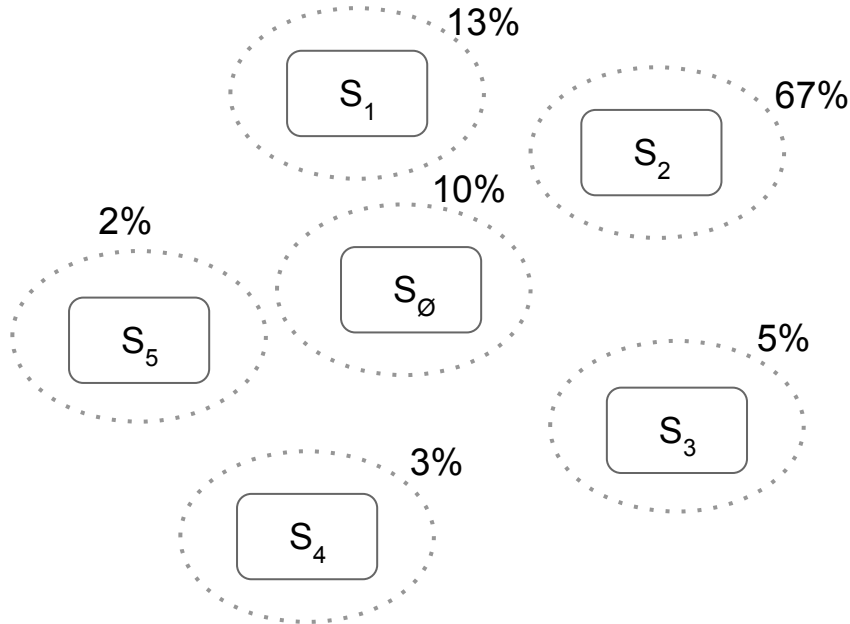
$S_2$ : {shipping block}

...



# Machine Learning Techniques

## Propose Most Effective Action



## Partially Observable Markov Decision Process (POMDP)

### States:

Issues or issue combinations, e.g.,

$S_1$ : {delivery block, billing block}

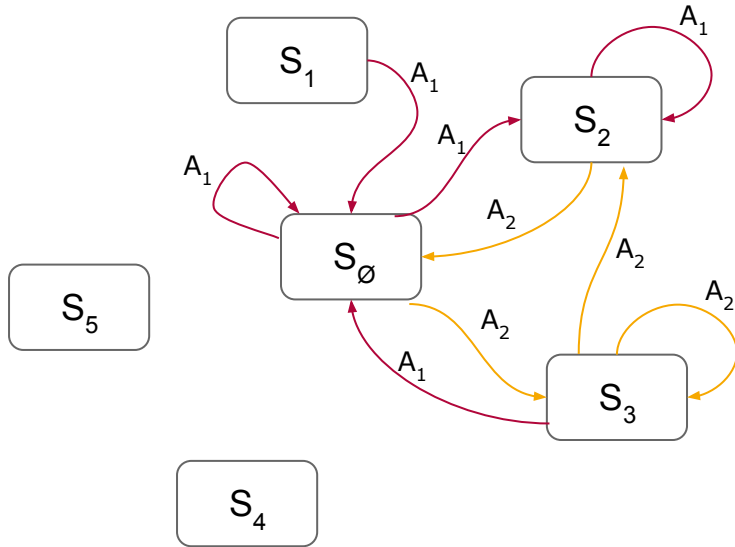
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### Initial belief state:

Decision trees for every state determine contribution to belief state

# Machine Learning Techniques

## Propose Most Effective Action



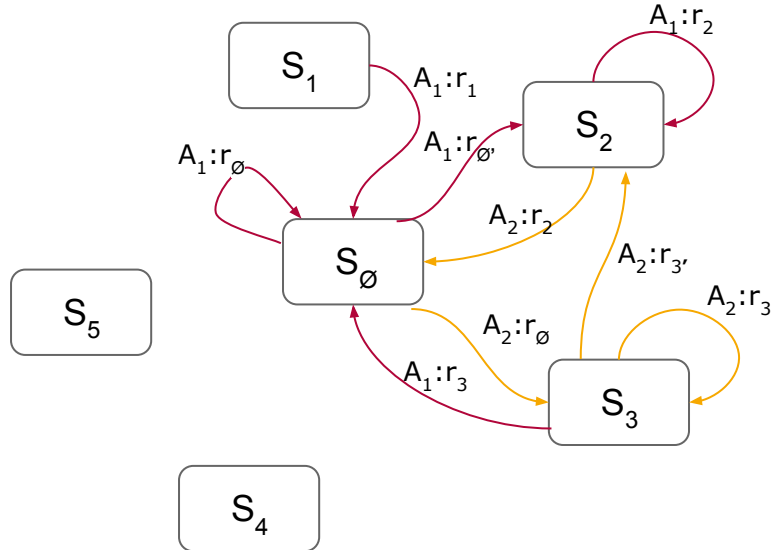
## Partially Observable Markov Decision Process (POMDP)

### Actions and transitional probabilities:

- Actions change a sales order's state with a certain probability (and can affect multiple states)
- Performing an action influences the belief state

# Machine Learning Techniques

## Propose Most Effective Action



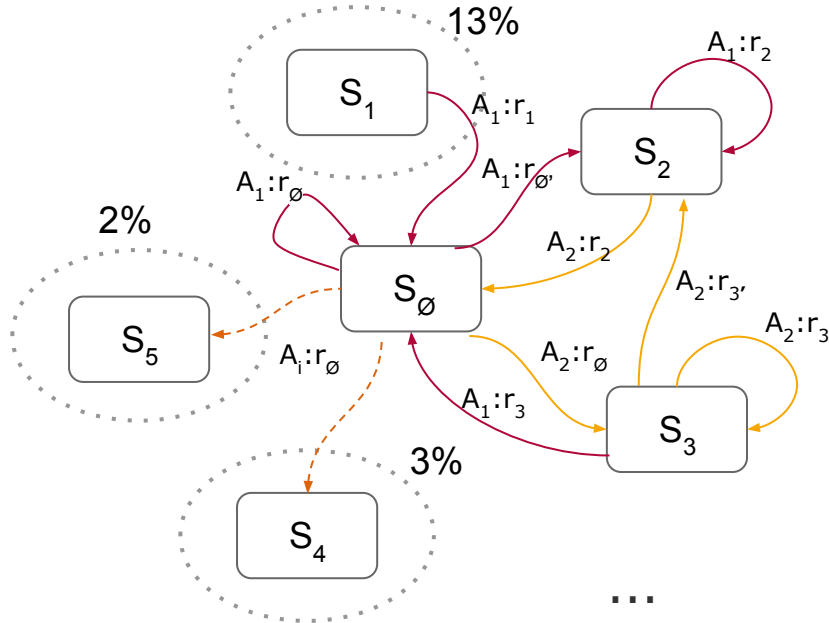
## Partially Observable Markov Decision Process (POMDP)

### Rewards:

- Actions have costs and benefits
- The reward for performing an action in a state helps to find the best action
- Costs could be delays caused by issues, contractual penalties, attorney's fees, ...

# Machine Learning Techniques

## Propose Most Effective Action



## Partially Observable Markov Decision Process (POMDP)

### POMDP:

- Finds **best long term action** (not necessarily obvious action)
- Considers an action's consequences on all states
- It is therefore superior to decision rules (e.g. mitigate current most severe issue)

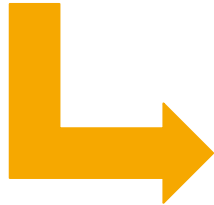
# Predictive Analytics for Order Fulfillment

## Action Proposal to Avoid Issues

PROPOSED ACTION

Mitigate Delivery Block

Show action




Delivery Block

7,755 of 7,780 similar sales orders had this issue.

Issue risk indicators Action

This sales order was created through an automated EDI process with the customer. EDI sales orders that shared similar characteristics were error-prone in the past. You can reconfirm the sales order details with the customer to ensure everything is as desired.

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✓ Done

🔗 Open in SAP Fiori

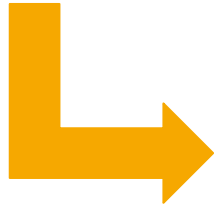
# Predictive Analytics for Order Fulfillment

## Action Proposal to Avoid Issues

PROPOSED ACTION

Mitigate Delivery Block

Show action



Invoicing Issue

163 of 184 similar sales orders had this issue.

Issue risk indicators

Action

The department's workload has been particularly high this week. This has often caused similar sales orders to be overlooked. Consider to assign an employee who takes responsibility for the fulfillment of this sales order.

 Alexis Smith

Assign Alexis

 James O'Brien

Assign James

 Cheng Nguyen

Assign Cheng

 Liam Colville

Assign Liam

✓ Done

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# Enterprise Platform and Integration Concepts

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