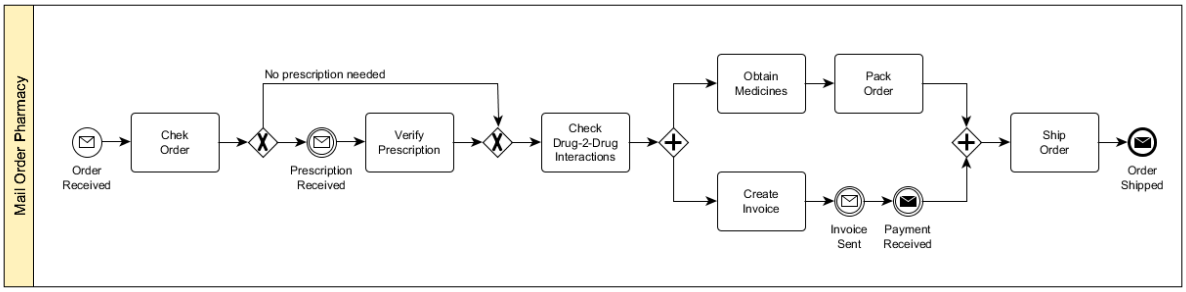
Input scenario:



Simulation setup:

Process simulation specification

Inter arrival time (between two instances): Normal | Mean: 5 | Standard deviation: 2 | Minutes

# of instances: 1000

Simulation start time: 2016-06-01 08:00:00

Currency: EUR

Resources

Add	Name	# of Resources	Cost per Hour		Timetable	
	Logistics Employee	2	25	EUR	Default	x
	Pharmacist	2	45	EUR	Default	x
	ERP System	1	1	EUR	Default	x

Timetable / Work schedule

Add	Name	Begin day	End day	Begin time	End time
	Default	Monday	Friday	09:00:00	17:00:00

Tasks

Name: **Check Order**
Resource: Logistics Employee | Fixed cost: | EUR
Duration: Fixed | to: 2 | Minutes

Name: **Verify Prescription**
Resource: Pharmacist | Fixed cost: | EUR
Duration: Normal | Mean: 3 | Standard deviation: 2 | Minutes

Name: **Check Drug2Drug Interaction**
Resource: Pharmacist | Fixed cost: | EUR
Duration: Normal | Mean: 3 | Standard deviation: 2 | Minutes

Name: **Obtain Medicines**
Resource: Logistics Employee | Fixed cost: | EUR
Duration: Normal | Mean: 6 | Standard deviation: 3 | Minutes

Name: **Create Invoice**
Resource: ERP System | Fixed cost: | EUR
Duration: Fixed | to: 1 | Seconds

Name: **Pack Order**
Resource: Logistics Employee | Fixed cost: 0.5 | EUR
Duration: Exponential | Mean: 4 | Minutes

Name: **Ship Order**
Resource: Logistics Employee | Fixed cost: 4 | EUR
Duration: Fixed | to: 1 | Minutes

Gateways

Exclusive (XOR) **N/A**

N/A 65 %

Prescription Received 35 %

Intermediate events

Name: **Prescription Received**

Duration: Fixed to: 1 Seconds

Name: **Payment Received**

Duration: Fixed to: 1 Seconds

Question#1

What is the total cost of the analyzed scenario?

Answer#1

General information

Completed process instances 1000

Total cost 13040.4 EUR

Total simulation time 2.7 weeks

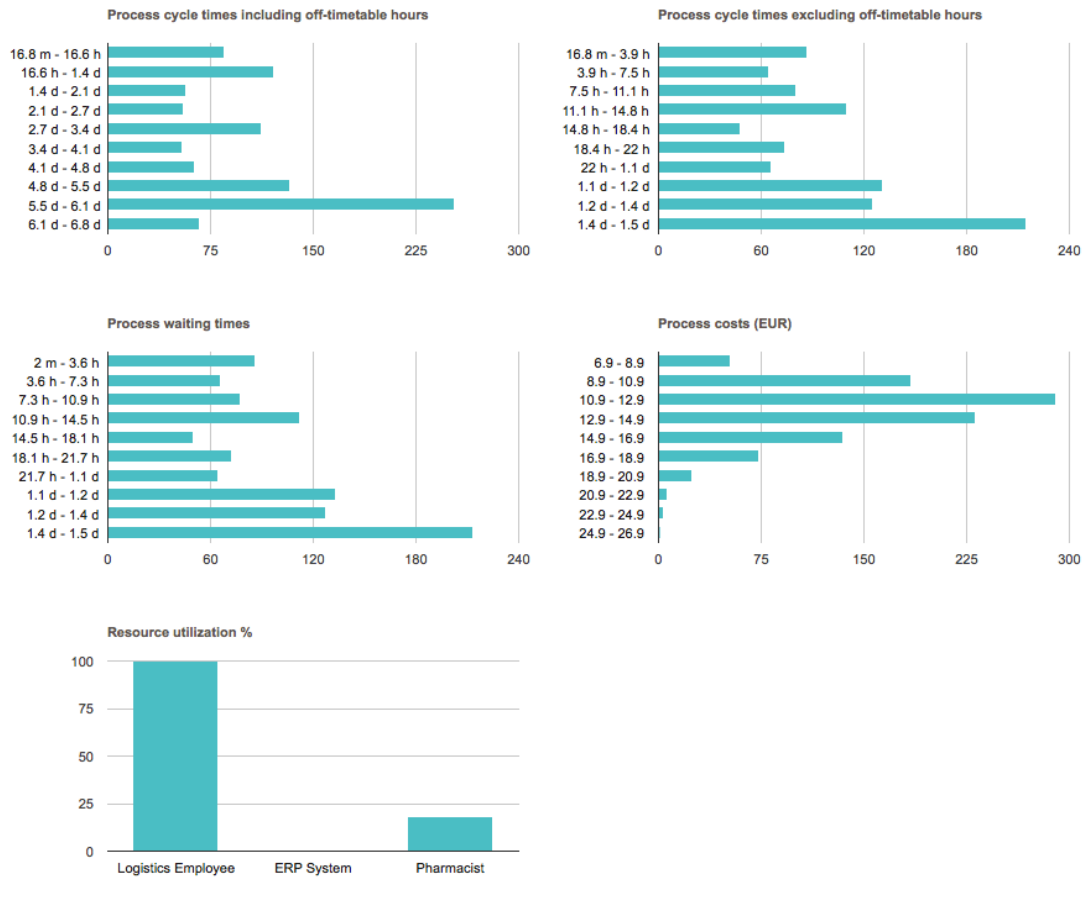
Total cost is 13,000.00 euro for a period of time of 2.7 weeks

Question#2

Is there any bottleneck in this process?

Answer#2

Charts



Yes, the bottleneck is the unbalanced resource utilization. Logistics Employees have an undisered high utilization percentage of nearly 100%. Pharmacists are only utilized for a little under 18%.

Process instance cycle times including off-timetable hours

Minimum cycle time 16.8 minutes **Maximum cycle time** 6.8 days **Average cycle time** 3.8 days

Process instance cycle times excluding off-timetable hours

Minimum cycle time 16.8 minutes **Maximum cycle time** 1.5 days **Average cycle time** 21.5 hours

Process instance costs

Minimum process cost 6.9 EUR **Maximum process cost** 25.8 EUR **Average cost** 13 EUR

This leads to a high average cycle time of 3.8 days (compared to a minimum of less than 17 minutes)!

Task costs and waiting times

Task name	Average cost	Average waiting time
Check Drug2Drug Interaction	2.4 EUR	8.5 seconds
Check Order	0.8 EUR	4.9 hours
Create Invoice	0 EUR	0.3 seconds
Obtain Medicines	2.5 EUR	5.4 hours
Pack Order	2.2 EUR	5.6 hours
Payment Received	0 EUR	0 seconds
Prescription Received	0 EUR	0 seconds
Ship Order	4.4 EUR	5.3 hours
Verify Prescription	2.1 EUR	7.4 seconds

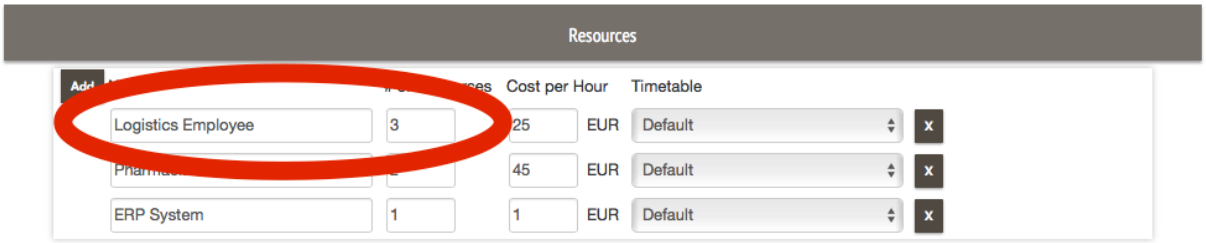
Long waiting time can be observed on all tasks performed by Logistics Employees.

Question#3

Make at least two recommendations to improve the process?

Answer#3

Recommendation #1:



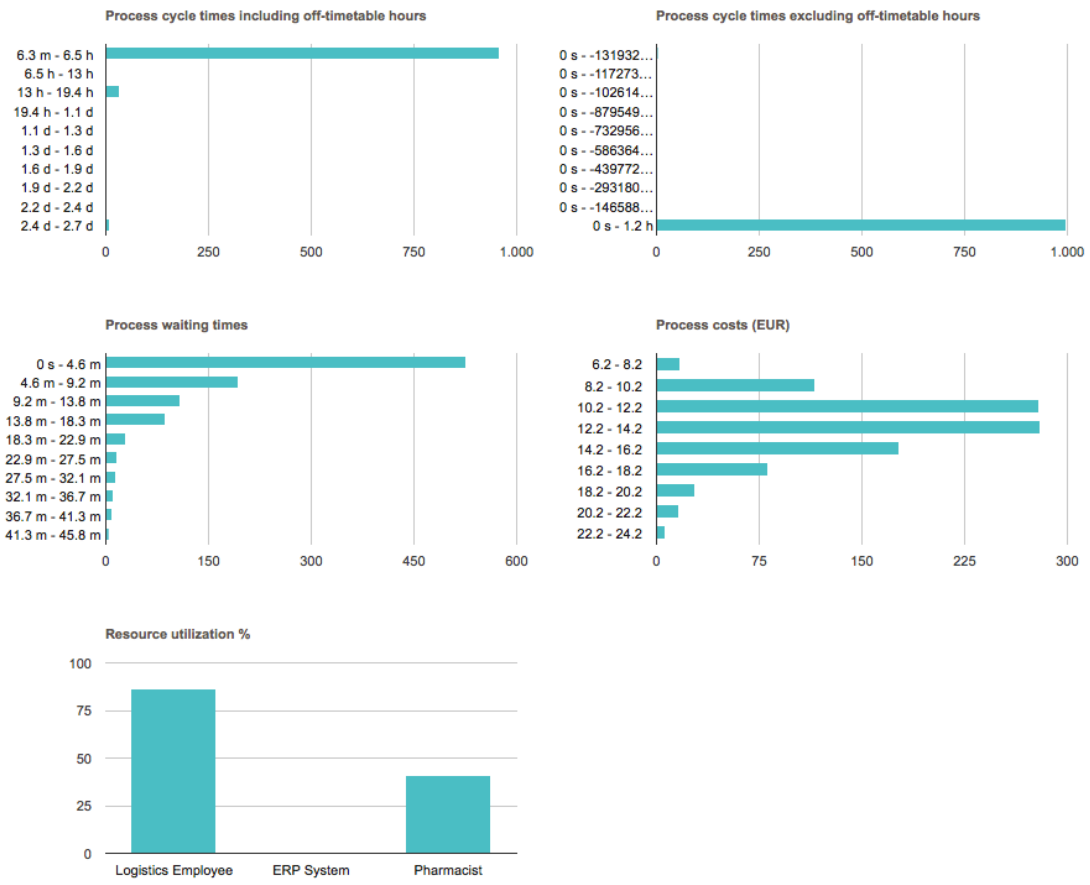
Hire an additional Logistics Employee

General information

Completed process instances 1000
Total cost 13054.6 EUR
Total simulation time 2 weeks

- Total cost will increase because the processing time will decrease.

Charts



- Better figures on Logistics Employee and Pharmacist utilization percentages.
- The vast majority of all orders is handled within 6.5 hours.

Process instance cycle times including off-timetable hours

Minimum cycle time 6.2 minutes **Maximum cycle time** 2.7 days **Average cycle time** 1.5 hours

Process instance cycle times excluding off-timetable hours

Minimum cycle time -1465917798.8 seconds **Maximum cycle time** 1.2 hours **Average cycle time** 24.3 minutes

Process instance costs

Minimum process cost 6.2 EUR **Maximum process cost** 23.8 EUR **Average cost** 13.1 EUR

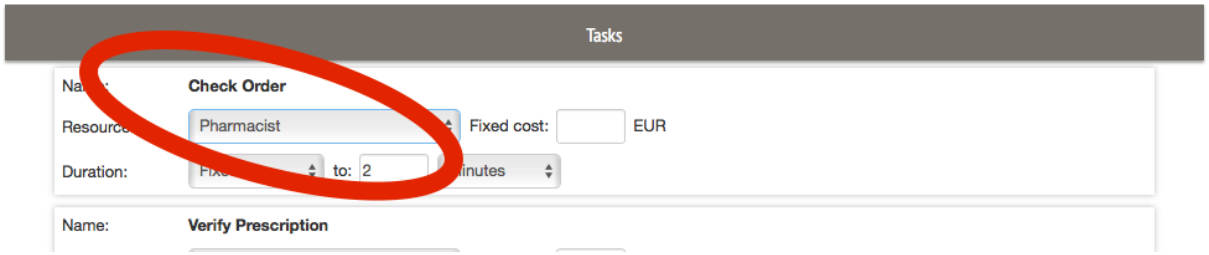
- Average cycle time drops to 1.5 hours (was 3.8 days).

Task costs and waiting times

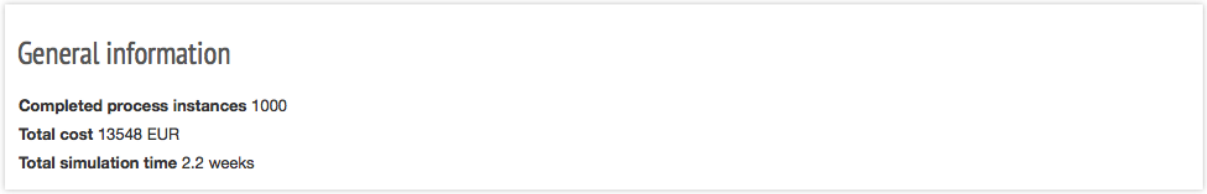
Task name	Average cost	Average waiting time
Check Drug2Drug Interaction	2.4 EUR	5.1 seconds
Check Order	0.8 EUR	1.9 minutes
Create Invoice	0 EUR	0.2 seconds
Obtain Medicines	2.5 EUR	1.6 minutes
Pack Order	2.2 EUR	1.7 minutes
Payment Received	0 EUR	0 seconds
Prescription Received	0 EUR	0 seconds
Ship Order	4.4 EUR	1.8 minutes
Verify Prescription	2.3 EUR	6.5 seconds

- Waiting time drops dramatically on all Logistics Employee tasks.

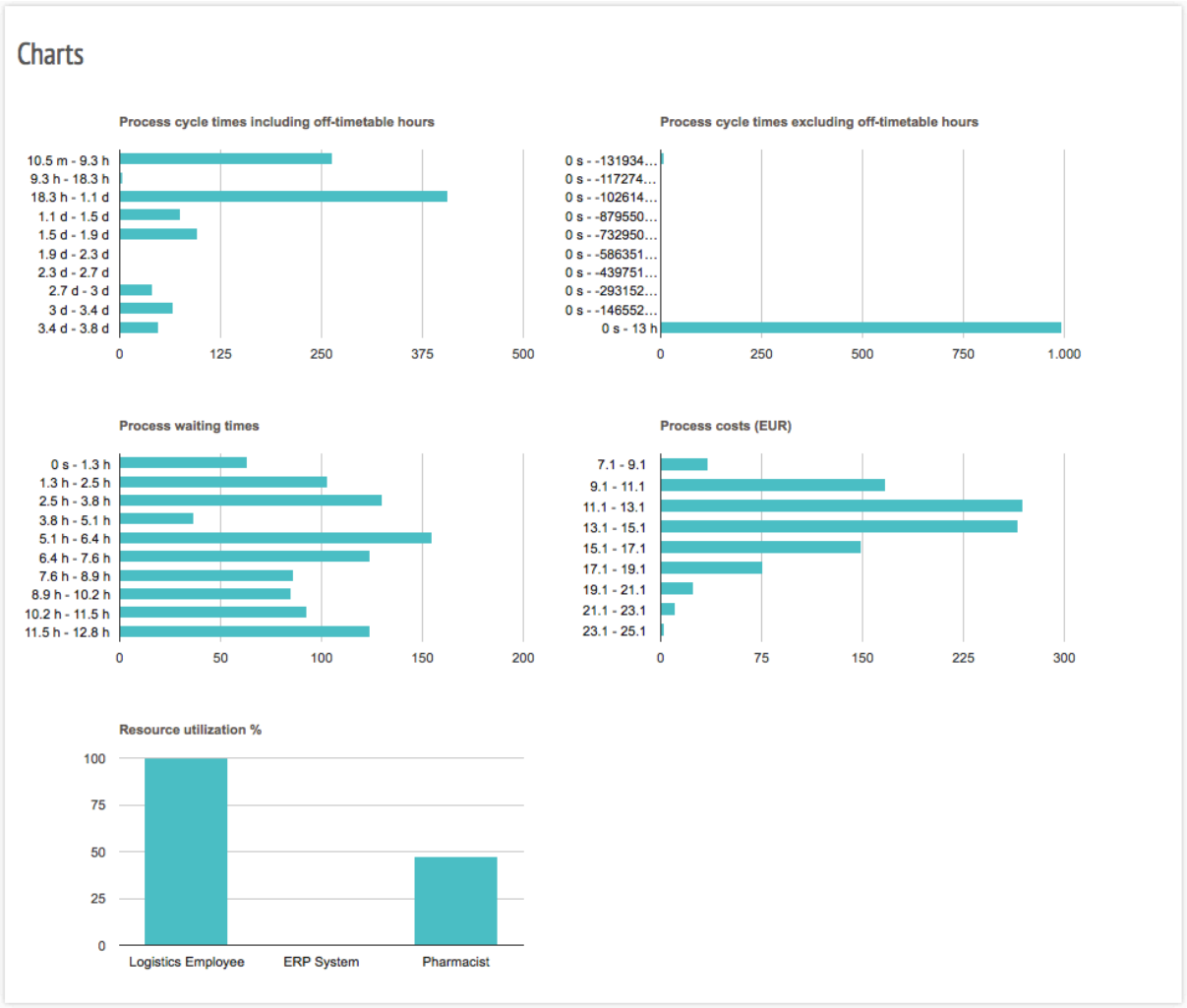
Recommendation #2:



Re-assign the Check Order task to a Pharmacist.



- Total cost will increase because the Pharmasist is more expensive and because the processing time will decrease.



- Better figures on Pharmacist utilization percentages. Logistics Employees still have an undisered utilization percentage of nearly 100%.

Process instance cycle times including off-timetable hours

Minimum cycle time 10.5 minutes **Maximum cycle time** 3.8 days **Average cycle time** 1.2 days

Process instance cycle times excluding off-timetable hours

Minimum cycle time -1465948112.4 seconds **Maximum cycle time** 13 hours **Average cycle time** 6.9 hours

Process instance costs

Minimum process cost 7.1 EUR **Maximum process cost** 23.8 EUR **Average cost** 13.5 EUR

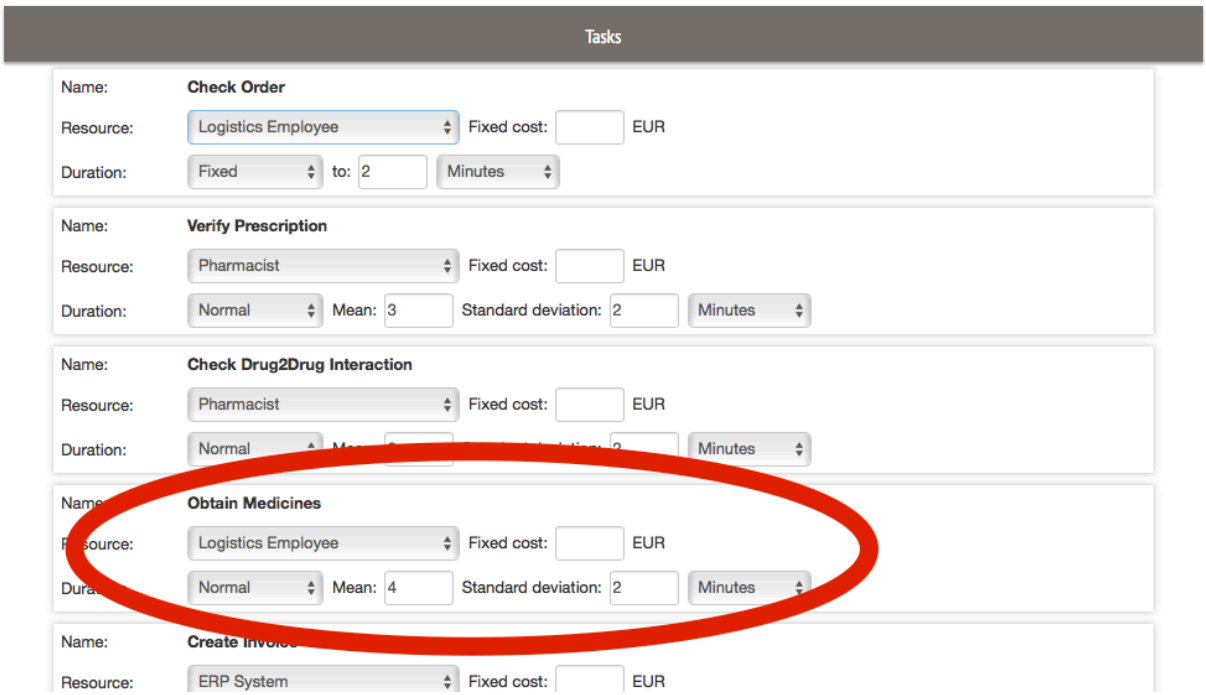
- Average cycle time improves to 1.2 days (was 3.8 days).

Task costs and waiting times

Task name	Average cost	Average waiting time
Check Drug2Drug Interaction	2.3 EUR	4.8 seconds
Check Order	1.5 EUR	9.3 seconds
Create Invoice	0 EUR	0.1 seconds
Obtain Medicines	2.5 EUR	2.2 hours
Pack Order	2.1 EUR	2.2 hours
Payment Received	0 EUR	0 seconds
Prescription Received	0 EUR	0 seconds
Ship Order	4.4 EUR	2.2 hours
Verify Prescription	2.2 EUR	3.2 seconds

- Waiting time improves on all Logistics Employee tasks.

Recommendation #3:



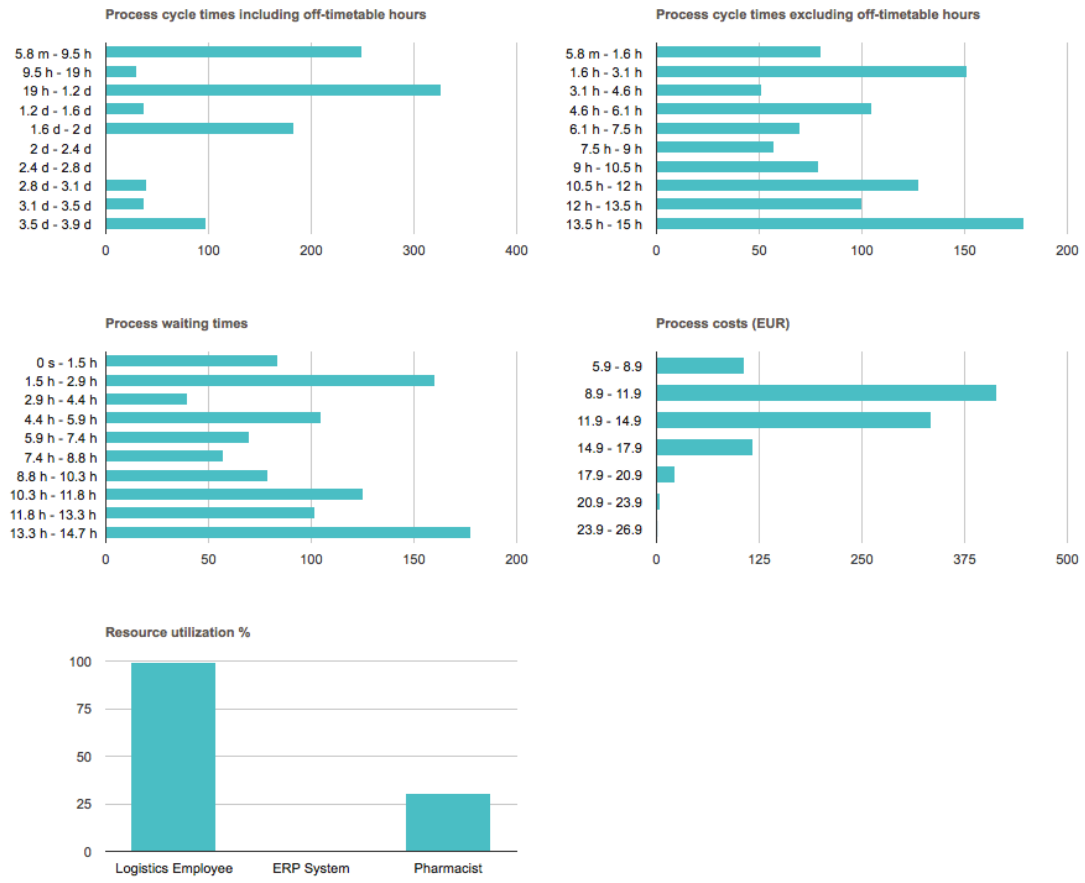
Implement a warehouse management system in order to improve the Obtain Medicines task.

General information

Completed process instances 1000
Total cost 12091.7 EUR
Total simulation time 2.2 weeks

- Total cost will decrease.

Charts



- Logistics Employees still have an undisered utilization percentage of nearly 100%. Pharmacists still are only utilized for 20%.

Process instance cycle times including off-timetable hours

Minimum cycle time 5.8 minutes **Maximum cycle time** 3.9 days **Average cycle time** 1.4 days

Process instance cycle times excluding off-timetable hours

Minimum cycle time 5.8 minutes **Maximum cycle time** 15 hours **Average cycle time** 8.2 hours

Process instance costs

Minimum process cost 5.9 EUR **Maximum process cost** 26.7 EUR **Average cost** 12.1 EUR

- Average cycle time improves to 1.4 days (was 3.8 days).

Task costs and waiting times

Task name	Average cost	Average waiting time
Check Drug2Drug Interaction	2.3 EUR	4.9 seconds
Check Order	0.8 EUR	2 hours
Create Invoice	0 EUR	0.1 seconds
Obtain Medicines	1.7 EUR	2 hours
Pack Order	2.1 EUR	2 hours
Payment Received	0 EUR	0 seconds
Prescription Received	0 EUR	0 seconds
Ship Order	4.4 EUR	2 hours
Verify Prescription	2.3 EUR	5.7 seconds

- Waiting time improves on all Logistics Employee tasks.

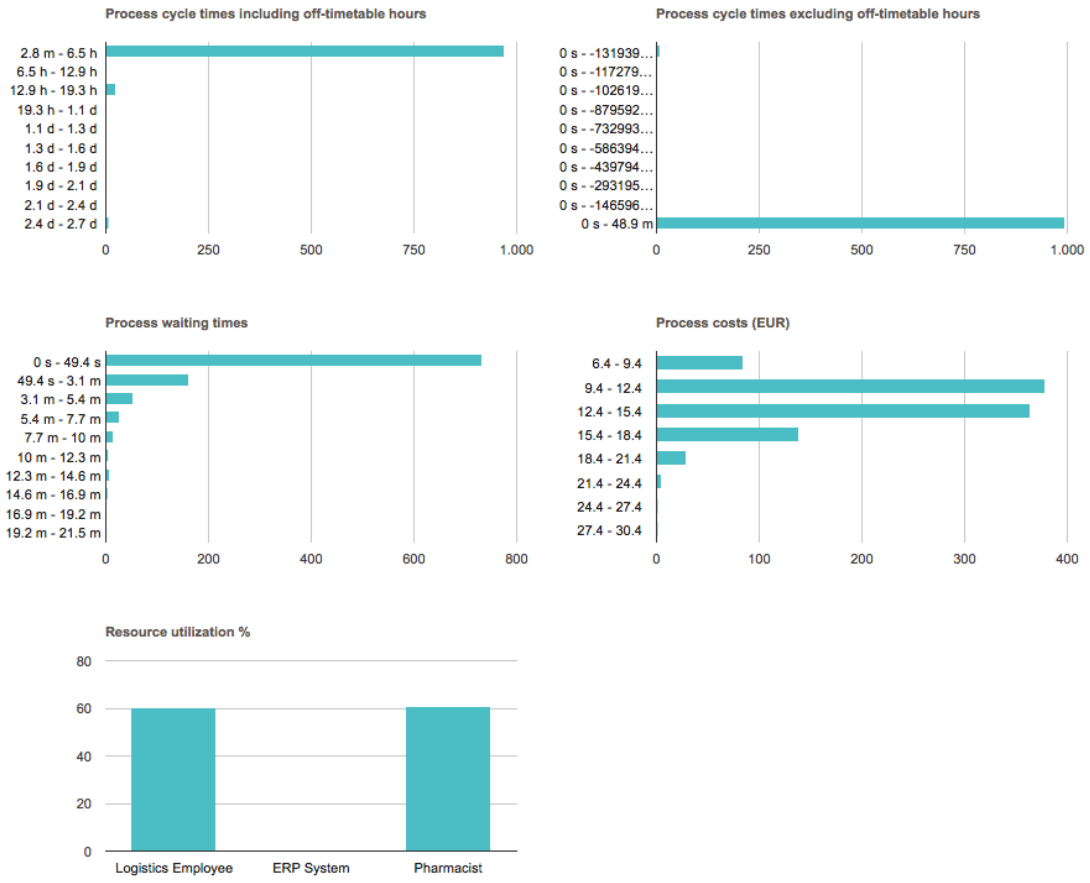
Recommendation #4:
Implement Recommendation #1, #2 and #3.

General information

Completed process instances 1000
Total cost 13007.7 EUR
Total simulation time 2 weeks

- Total cost will increase because the processing time will decrease.

Charts



- Much better figures on Logistics Employee and Pharmacist utilization percentages.
- The vast majority of all orders is handled within 6.5 hours.

Process instance cycle times including off-timetable hours

Minimum cycle time 2.8 minutes **Maximum cycle time** 2.7 days **Average cycle time** 1.1 hours

Process instance cycle times excluding off-timetable hours

Minimum cycle time -1465989598.6 seconds **Maximum cycle time** 48.8 minutes **Average cycle time** 16.4 minutes

Process instance costs

Minimum process cost 6.4 EUR **Maximum process cost** 27.8 EUR **Average cost** 13 EUR

- Average cycle time drops to 1.1 hours (was 3.8 days).

Task costs and waiting times

Task name	Average cost	Average waiting time
Check Drug2Drug Interaction	2.3 EUR	9 seconds
Check Order	1.5 EUR	12.2 seconds
Create Invoice	0 EUR	0.2 seconds
Obtain Medicines	1.7 EUR	12.2 seconds
Pack Order	2.2 EUR	10.4 seconds
Payment Received	0 EUR	0 seconds
Prescription Received	0 EUR	0 seconds
Ship Order	4.4 EUR	13.7 seconds
Verify Prescription	2.4 EUR	7.5 seconds

- Waiting time drops dramatically on most tasks.