

Process mining explained by an example

The logistics process at SmartCoat Inc.

What's on this week?



Process costs

What preceded ...



What preceded...



Marie, CEO of SmartCoat Inc., asked us to analyze and make recommendations for the logistics process via **process mining** and **data analytics** techniques ... Just by looking at the data in SmartCoat's ERP system!

In the sixth episode, Cédric discussed the most important interactions amongst the SmartCoaters. He also identified the paths smartphones traverse throughout the locations at SmartCoat Inc. As such, he discovered through which hands and locations smartphones pass during the logistics process.

Have you **missed** the **sixth episode**? Click on Marie ... and you will be redirected to the sixth episode!

Process costs



Cédric, your horsum guide



Cédric
Consultant

Hi, great to see you again!

In this episode, I will focus on the process costs. I will show you how much the logistics process costs from receipt until shipment to the retailer. In addition to the **shipped** smartphones, we will also take the **returned** uncoated smartphones and **scrapped** coated smartphones into account. Why? Because they both cost money ... and these costs are not paid back by the retailer. So, these costs should be covered by the sales margins. I will also investigate where it –financially- makes sense to optimize the process.

In this episode, I'm using a combination of Microsoft Excel and the process mining software Disco to perform the analyses.

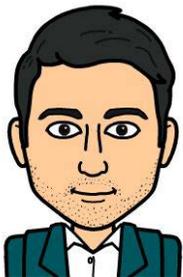


Do you remember the process activity costs Marie described us in Episode 1?
No? No problem. Read them on the next page.

Cédric, your horsum guide

The process activity costs are shown on the right. Marie distinguished 2 types : a cost per **activity** and a cost per **time duration**. For example, storage costs start when the smartphone is stored until the smartphone is picked.

In order to perform a sound analysis and to avoid to get into too much detail, I mapped each process activity to an activity group. I distinguish **8 activity groups**: receive, check, return, store, pick, coat, test & scrap and ship.



Activity description	Estimated cost price
RECEIVE UNCOATED	€ 0,50 per activity
CHECK OPERATION	€ 2,00 per activity
CHECK DAMAGE	€ 0,50 per activity
RETURN	€ 0,50 per activity
STORE UNCOATED	€ 0,10 per phone per 24 h
PICK-TO-COAT	€ 0,10 per activity
COATING	€ 20,00 per hour
TEST 1	€ 0,75 per activity
TEST 2	€ 0,25 per activity
TEST 3	€ 2,50 per activity
PROPOSE SCRAPPING	€ 0,05 per activity
EVALUATE SCRAPPING	€ 0,05 per activity
STORE COATED	€ 0,10 per phone per 24 h
PICK-TO-SHIP	€ 0,10 per activity
SHIP COATED	€ 0,50 per activity

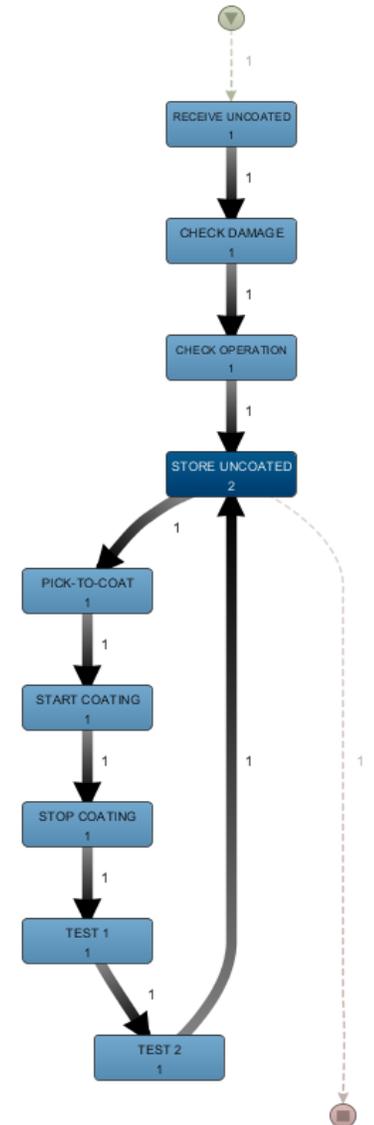
Cost	Unit	Activity Group
€ 0,50	Occurrence	RECEIVE
€ 2,00	Occurrence	CHECK
€ 0,50	Occurrence	CHECK
€ 0,50	Occurrence	RETURN
€ 0,10	Per 24 hours	STORE
€ 0,10	Occurrence	PICK
€ 480,00	Per 24 hours	COAT
€ 0,75	Occurrence	TEST & SCRAP
€ 0,25	Occurrence	TEST & SCRAP
€ 2,50	Occurrence	TEST & SCRAP
€ 0,05	Occurrence	TEST & SCRAP
€ 0,05	Occurrence	TEST & SCRAP
€ 0,10	Per 24 hours	STORE
€ 0,10	Occurrence	PICK
€ 0,50	Occurrence	SHIP

Cédric, your horsum guide

In Episode 4, I noted that the sum of the number of returned smartphones (#2), scrapped smartphones (#5) and shipments (#27) does not equal to the total number of cases (#35). The reason for this is because Phone 3663 was stored again in the Uncoated warehouse after testing... As a result, the smartphone had not left SmartCoat Inc. The path of Phone 3663 is shown in the process map on the right.

I will not take Phone 3663 into account to calculate the process costs. So, I will go on with 34 cases.

Event log analysis	Entire process map
Number of cases	35
Number of "returns"	2 (5,7% of cases)
Number of "scrapping"	5 (14,3% of cases)
Number of "shipments"	27 (77,1% of cases)



Analysis



1. Total process cost | all 34 cases

Activity group	Cost per activity group	Percentage of total cost
RECEIVE	€ 17,00	4,6%
CHECK	€ 68,50	18,6%
RETURN	€ 1,00	0,3%
STORE	€ 37,84	10,3%
PICK	€ 6,00	1,6%
COAT	€ 172,01	46,8%
TEST & SCRAP	€ 51,85	14,1%
SHIP	€ 13,50	3,7%
Total cost	€ 367,70	100,0%

On the table on the left, I note that the total process cost for the 34 cases amounts to € 367,70. The most important activity groups in terms of financial costs are:

- Check
- Store
- Coat
- Test & Scrap

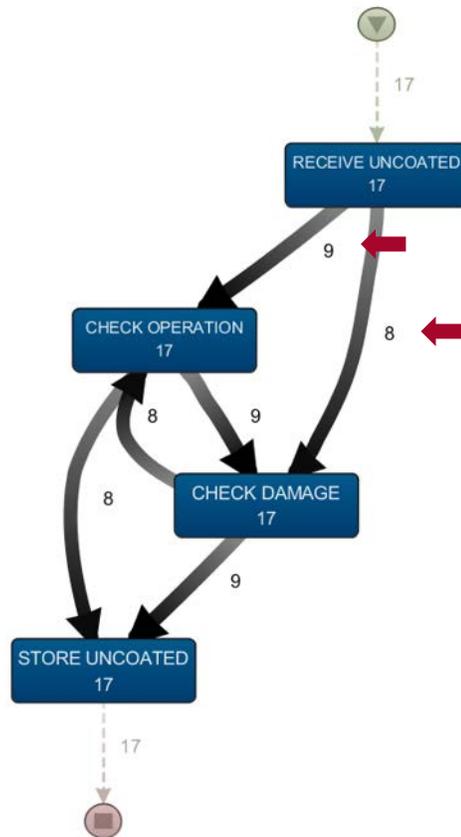
They are exactly the activity groups that I will further investigate. I wonder whether I can advise improved price settings or find potential savings...

You can find the details of the calculation in the Excel file.



2. Process cost of activity group 'check'

Activity description	Estimated cost price
CHECK OPERATION	€ 2,00 per activity
CHECK DAMAGE	€ 0,50 per activity

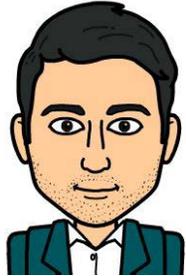


Marie told us that all received **uncoated** smartphones need to be **checked** before storage. In the second episode, as shown on the left, we saw that 17 smartphones are subjected to two inbound checks. For 9 smartphones the 'check operation' activity is done prior to the 'check damage' activity, the other 8 smartphones are checked in reverse order.

From a financial perspective, it is clear that it is better to perform the **damage check** at € 0,50 **before** the **operation check** at € 2,00. When a smartphone results in a return after the damage check, only € 0,50 is spent in that case instead of € 2,50.



3. Process cost of activity group 'store'



In the fifth episode, as shown in the table below, I identified that the mean duration of smartphones from *Wallsmart* (8,6 days in 'warehouse uncoated' and 8,5 days in 'warehouse coated') is longer than those from *Callhouse* and *Phonemarket*.

Considering a storage cost of € 0,10 per phone per 24 hours, SmartCoat should take actions to **lower** the **storage time** (waiting time) for **Wallsmart** smartphones.

Event log analysis		Entire process map		Wallsmart	Callhouse	Phonemarket
'Store uncoated' > 'Pick-to-coat'						
Total duration	32,2 weeks (225,4 days)			77,7 days	16,1 weeks (112,7 days)	35,1 days
Mean duration	6,6 days			8,6 days	6,2 days	5,0 days
'Store coated' > 'Pick-to-ship'						
Total duration	22,4 weeks (156,8 days)			51,3 days	73,7 days	32,1 days
Mean duration	6,0 days			8,5 days	5,3 days	5,3 days

4. Process cost benchmarking | 34 cases



SmartCoat's customers (*retailers*) pay for each **shipped** coated smartphone. Costs regarding returned or scrapped smartphones, are covered by SmartCoat.

In the first episode, Marie told us that SmartCoat maintains *fixed sales prices* for its coating services, independent from the smartphone brand. She also told us that *Wallmart* (€ 22,00) pays *10% more* than *Callhouse* and *Phonemarket* (€ 20,00) for the coating service because they ask for an additional waterproof test.

In order to conduct a sound process cost analysis, I will divide the total process cost (€ 367,70) for the 34 cases into pieces. I will calculate the process costs per retailer (**Wallmart**, **Callhouse** and **Phonemarket**). Additionally, I will calculate the process costs for smartphones that are **shipped**, **returned** or **scrapped**. Let's discuss this further on the following page.

4. Process cost benchmarking | 34 cases

Event log analysis	Entire process map		Walmart	Callhouse	Phonemarket	
Number of cases	#34	€ 313,47	#9	€ 122,71	#6	€ 48,24
Number of "returns"	#2	€ 3,00	#0	-	#0	-
Number of "scrapping"	#5	€ 51,24	#1	€ 13,17	#3	€ 7,47
Number of "shipments"	#27	€ 367,70	#8	€ 135,88	#14	€ 176,11

The table above indicates whether a smartphone has been returned, scrapped or shipped. The total cost is split up per customer (*retailer*).

Each of these smartphones has followed a different journey in the logistics process. With process mining software, it is relatively easy to generate the event log per type (return, scrapping or shipment). As a result, it is also quite easy to calculate the process activity cost per type and per retailer. Are your curious how I have done this?

Well... you can find the detailed calculation in the Excel file.



4. Process cost benchmarking | 34 cases



On the next page, I go a step further. I calculate **per retailer** and **per process activity** the related **costs** for the **shipped smartphones**. In a second step, I divide these calculated costs by the number of shipped smartphones. In that way, I have an idea of the *average process cost* of a shipped smartphone per retailer. I call these costs the **direct cost price**. It allows me to compare the direct cost price amongst the retailers.

As explained earlier, SmartCoat needs to bear the costs for returned and scrapped smartphones. They cannot charge these costs to the retailer... As a consequence, it is relevant to have some insights in these costs per retailer. That's why I allocate the costs for returned and scrapped smartphones to the shipped smartphones. I call this cost the **allocated cost price**.

The sum of the direct and allocated cost prices gives me the **total cost price** of a shipped smartphone.

Euh... can you still follow? Let's have a look at the calculation on the next page.

4. Process cost benchmarking | 34 cases

	Wallmart	Callhouse	Phonemarket	All smartphones
<i>Number of "shipments"</i>	8	14	5	27
Sales price	€ 22,00	€ 20,00	€ 20,00	
Direct cost price	€ 15,34	€ 10,18	€ 9,65	€ 11,61
RECEIVE	€ 0,50	€ 0,50	€ 0,50	€ 0,50
CHECK	€ 2,50	€ 1,96	€ 2,50	€ 2,22
STORE	€ 1,48	€ 1,13	€ 1,31	€ 1,27
PICK	€ 0,18	€ 0,20	€ 0,24	€ 0,20
COAT	€ 6,68	€ 4,86	€ 3,60	€ 5,17
TEST & SCRAP	€ 3,50	€ 1,03	€ 1,00	€ 1,75
SHIP	€ 0,50	€ 0,50	€ 0,50	€ 0,50
Allocated cost price	€ 1,65	€ 2,40	€ 1,49	€ 2,01
Total cost price	€ 16,99	€ 12,58	€ 11,14	€ 13,62
Margin	€ 5,01	€ 7,42	€ 8,86	
<i>Margin %</i>	22,8%	37,1%	44,3%	

4. Process cost benchmarking | 34 cases



When I compare the average **direct cost** per retailer, I see that **Wallsmart** is **more expensive** (€ 15,34) than *Callhouse* and *Phonemarket*. At first sight, this looks normal because an **additional test** needs to be performed for *Wallsmart*. We also know that the sales price is 10% higher for this retailer. But when we look in more detail, we also see that the coating cost is also much higher for *Wallsmart*. This is because *Wallsmart* **only** sells **MePhones**. In episode 4 'benchmarking', I noted that it takes more time to coat a *MePhone* compared to a *Simsong*. The total margin for a *Wallsmart* smartphone (22,8%) is much lower than these of the other retailers. This is because the **higher direct costs** are **not reflected** in the **sales price**... A 10% higher sales price is not enough to cover the higher direct cost. I suggest that SmartCoat increases the sales price for *Wallsmart*.

When I compare **Callhouse** with *Phonemarket*, I see that the margin of *Callhouse* is slightly lower. This is because *Callhouse* sells both *MePhones* and *Simsongs* whilst *Phonemarket* only sells *Simsongs*. Also the **allocated cost price** is a bit **higher** for *Callhouse*. This is caused by the higher number of returns. We should talk with *Callhouse* and ask them to perform more checks before they ship their uncoated smartphones to SmartCoat Inc.

Feedback to Marie



Feedback



Hi Marie, I have analyzed the costs related to the logistics process.

From a financial perspective, it is better to perform the **damage check** at € 0,50 **before** the **operation check** at € 2,00. When a smartphone results in a return after the damage check, only € 0,50 is spent in that case instead of € 2,50.

I also advise to **renegotiate** the **sales price** with **Wallsmart**. The higher sales price (+10%) you ask from Wallsmart does not cover the higher direct cost price. The higher cost price is not only related to the additional test, but also to the fact that the coating activity for *MePhones* is more expensive... and *Wallsmart* exclusively works with *MePhones*.

Finally, I suggest to talk with *Callhouse*. There are more smartphone returns for *Callhouse* compared to the other retailers. This results in higher average allocated costs.

Do you want to know how **to predict** process outcomes? Or are you interested in **monitoring** your process in **real-time**?



Watch the episode next week!

Planning

April 7th, 2016		Episode 1: introduction
April 14th, 2016		Episode 2: process discovery
April 21st, 2016		Episode 3: process deviations
April 28th, 2016		Episode 4: benchmarking
May 5th, 2016		Episode 5: bottlenecks
May 12th, 2016		Episode 6: interactions
May 19th, 2016		Episode 7: process costs
May 26th, 2016		Episode 8: prediction and real-time

Or check our website! www.horsum.be

Questions? **Contact us!**

Contact us!



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Processes, data, finance and business control

Result-driven, pragmatically and customized



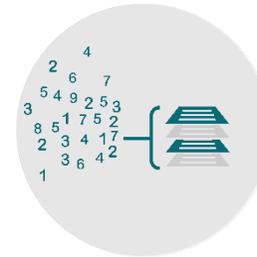
Process optimization



Financial projects



Internal audit



Data analytics



Process mining

