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Business Analytics and Data Warehouse Management

Case Study: Process Mining

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1. Background

This case study deals with conformance-oriented process mining in a sales process. Our manufacturing company produces umbrellas and sun shades.

The process – in its ideal variation has the following steps (see details below):

- Write quote (and send it, automatically included in the SAP functionality via customized channels);
- Change quote (if necessary);
- Convert quote into order and write order;
- Change order (should be the absolute exception);
- Outbound delivery;

Each process step is considered on a line item level, as a quote or order may have several line items.

For an introduction to process mining, see Aalst, W. vd, *Process Mining - Discovery, Conformance and Enhancement of Business Processes*, Springer, 2011.

2. The Process

In the following, the process to be analysed is depicted in SAP S/4Hana.

For more details see Bagnato, D., Müller-Török, R., Prosser, A., *Business Computing with SAP*, Facultas, 2022.

As a first step, we are going to create a quote (sales information is disregarded). This is done via the following menu path.

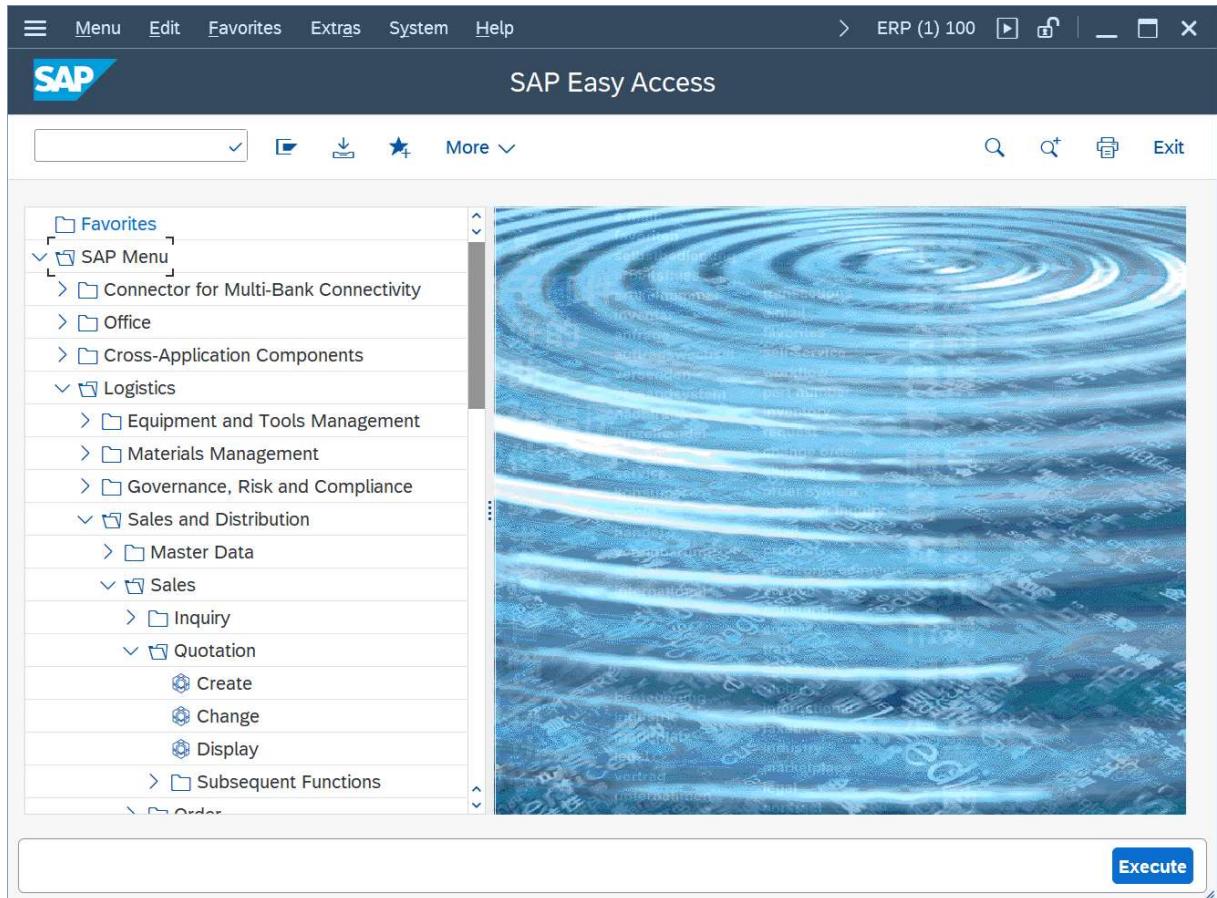


Figure 1: Menu path create quote (© SAP SE)

In the initial screen, select Quotation type “QT”, Sales organisation 3910, Channel 01 and Division 01 and confirm with <Enter>. In the following quotation document, select a customer (as sold-to and ship-to party) and the following line items (three sunshades available in the system). Also select a valid-to date for the quote.

The quote may now be saved, but let us explore the transaction status, which can be done via menu *System => Status*. The transaction, cf. circle in Figure 3, is VA21. This will be one of the main characteristics in the process mining cube to be defined.

Close the status window and save the quote by clicking on the floppy disk symbol. The system answers with a message that quotation <Document Number> has been saved. Changing the quotation is done via transaction VA22.

Also the material/s selected, the customer (we will disregard the case that sold-to and ship-to party are different) and the user will be included in our analysis. Regarding the user the assumption will be that the system user is also the person responsible for the transaction.

Sales Document Edit Goto Extras Environment System Help > ERP (1) 100 Exit

Create Quotation: Overview

Quotation: Net Value: 27.600,00 EUR

Sold-to Party: Meier Umbrellas, Landstraße 123, 1030 Wien, Austria

Ship-to Party: Meier Umbrellas, Landstraße 123, 1030 Wien, Austria

Cust. Reference: Cust. Ref. Date:

Sales **Item Overview** Item detail Ordering party Procurement Shipping Reason for rejection

Valid From: 05.02.2026 Valid To: 31.03.2026

Req. Deliv.Date* D 05.02.2026 Expect.Ord.Val.: 19.320,00 EUR

All Items

	Item	Material	Req...	Order Quantity	SU	AltItm	Item Description
<input type="checkbox"/>	103			100 PC			Sunshade Balmoral Beach
<input type="checkbox"/>	202			50 PC			Sunshade Watson Bay
<input type="checkbox"/>	301			80 PC			Sunshade Salamander Shore

Save Cancel

Figure 2: Create quote (© SAP SE)

As usual, the date of the posting will be decomposed into its components and serve as the time dimension.

After saving the document, the order is created from the quote. For the menu path, see Figure 4.

System: Status

Usage data

Client: 100	Previous logon: 05.02.2026 09:48:04
User: PROSSER	Logon: 14:33:20
Language: EN	System time: 14:40:53

Number of Failed Password Logon Attempts: 0

SAP data

Repository data

Transaction: VA21	Screen number: 4001
Program (screen): SAPMV45A	Screen number: 4701
Program (Subdynpro): SAPMV45A	GUI status: U
Program (GUI): SAPMV45B	

SAP System data

Product Version: - See Details -	🔍
Installation Number: 0021093032	License Expires On: 31.12.9999
Unicode System: Yes	

Host data

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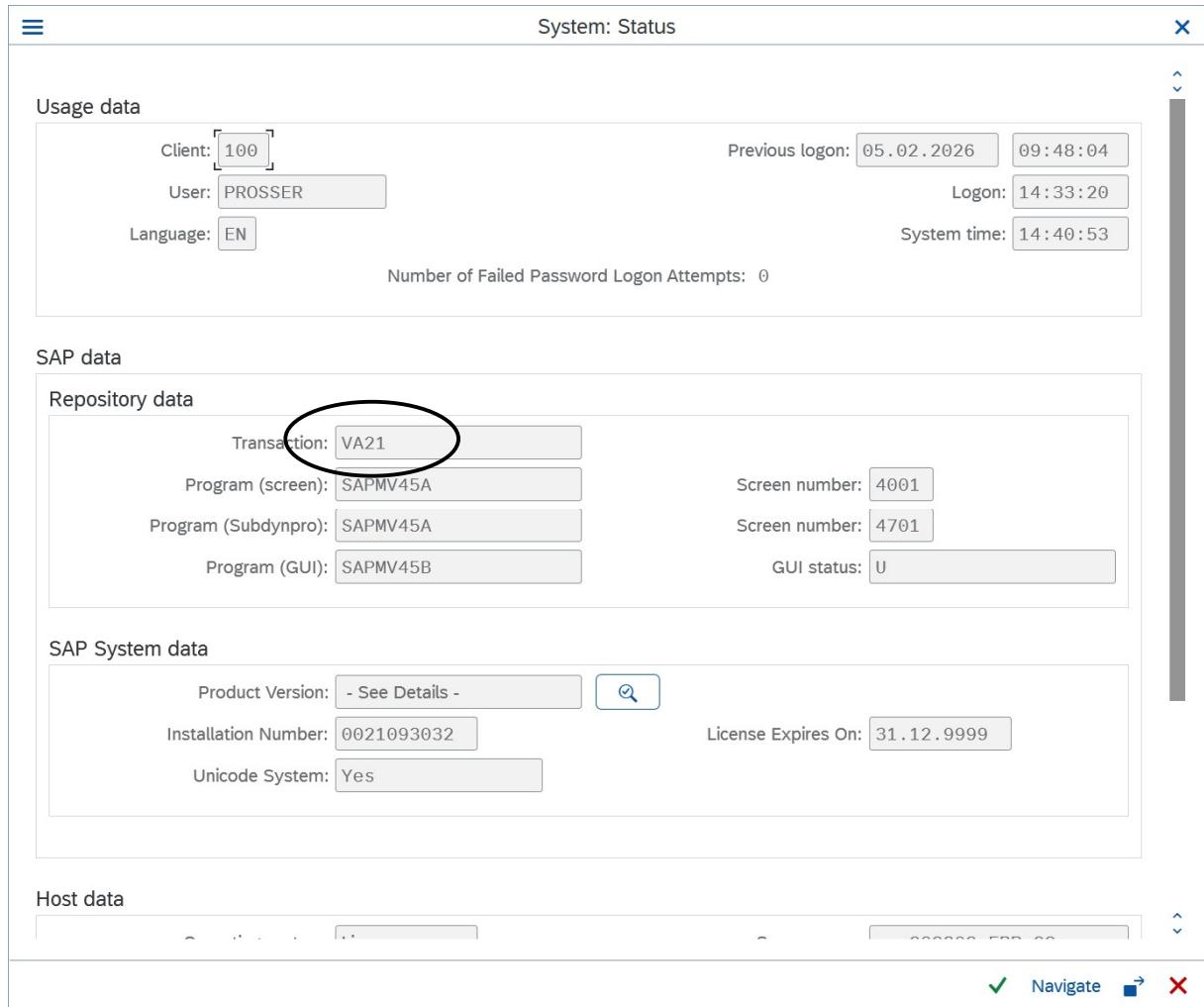


Figure 3: Transaction status (© SAP SE)

Sales Document Edit Goto Extras Environment System Help > ERP (1) 100

Create Standard Order: Overview

Standard Order: [] Net Value: 27.600,00 EUR

Sold-to Party: 1 Meier Umbrellas, Landstraße 123, 1030 Wien, Austria

Ship-to Party: 1 Meier Umbrellas, Landstraße 123, 1030 Wien, Austria

Cust. Reference: 12312323 Cust. Ref. Date: 05.02.2026

Sales Item Overview Item detail Ordering party Procurement Shipping Reason for rejection

Requested Deliv.Date* D 05.02.2026 Delivering Plant: []

All Items

Item	Material	Req...	Order Quantity	Un	S	Item Description
<input type="checkbox"/> 101			80 PC	<input checked="" type="checkbox"/>		Sunshade Salamander Shores
<input type="checkbox"/> 202			50 PC	<input checked="" type="checkbox"/>		Sunshade Watson Bay
<input type="checkbox"/> 303			100 PC	<input checked="" type="checkbox"/>		Sunshade Balmoral Beach
				<input type="checkbox"/>		
				<input type="checkbox"/>		

Save Cancel

Figure 4: Menu path create order (© SAP SE)

Sales organisation, channel and division are already filled in, select Document type “OR”. However, the existing quote will be used as a reference for the order, hence select “Create with reference”.

You will find the quote copied into the order. Let us assume, however, that one line item “Balmoral Beach” was not ordered and is to be cancelled. Select the line header of the line item and the “Delete item” button below (see bubble in Figure).

Also enter PO number and date as shown in Figure . Save the document with the floppy disk symbol and you will again receive a confirmation “Standard order <Document Number> has been saved. Selecting System => Status again reveals the transaction number shown in Figure , VA01.

One may also enter the document in change mode and edit the data. The status information reveals another transaction, VA02 (cf. Figure).

All transactions are recorded with user information and timestamp. This enables us to build a data warehouse cube for process mining.

Sales Document Edit Goto Extras Environment System Help > ERP (1) 100

Create Standard Order: Overview

Standard Order: Net Value: EUR

Sold-to Party: Meier Umbrellas, Landstraße 123, 1030 Wien, Austria

Ship-to Party: Meier Umbrellas, Landstraße 123, 1030 Wien, Austria

Cust. Reference: Cust. Ref. Date:

Sales **Item Overview** Item detail Ordering party Procurement Shipping Reason for rejection

Requested Deliv.Date* Delivering Plant:

All Items

Item	Material	Req...	Order Quantity	Un	S	Item Description
<input type="checkbox"/>	101		80 PC	<input checked="" type="checkbox"/>	Sunshade Salamander Shores	
<input type="checkbox"/>	202		50 PC	<input checked="" type="checkbox"/>	Sunshade Watson Bay	
<input type="checkbox"/>	303	<input type="text"/>	100 PC	<input checked="" type="checkbox"/>	Sunshade Balmoral Beach	
				<input type="checkbox"/>		
				<input type="checkbox"/>		

Save **Cancel**

Figure 5: Delete line item (© SAP SE)

System: Status

Usage data

Client: 100	Previous logon: 05.02.2026 09:48:04
User: PROSSER	Logon: 14:33:20
Language: EN	System time: 14:56:34

Number of Failed Password Logon Attempts: 0

SAP data

Repository data

Transaction: VA01	Screen number: 101
Program (screen): SAPMV45A	GUI status: A0
Program (GUI): SAPMV45B	

SAP System data

Product Version: - See Details -	🔍
Installation Number: 0021093032	License Expires On: 31.12.9999
Unicode System: Yes	

Host data

Operating system: Linux	Server name: sap202302_ERP_22
Processor: Intel Core i7-10700K	Memory: 32 GB

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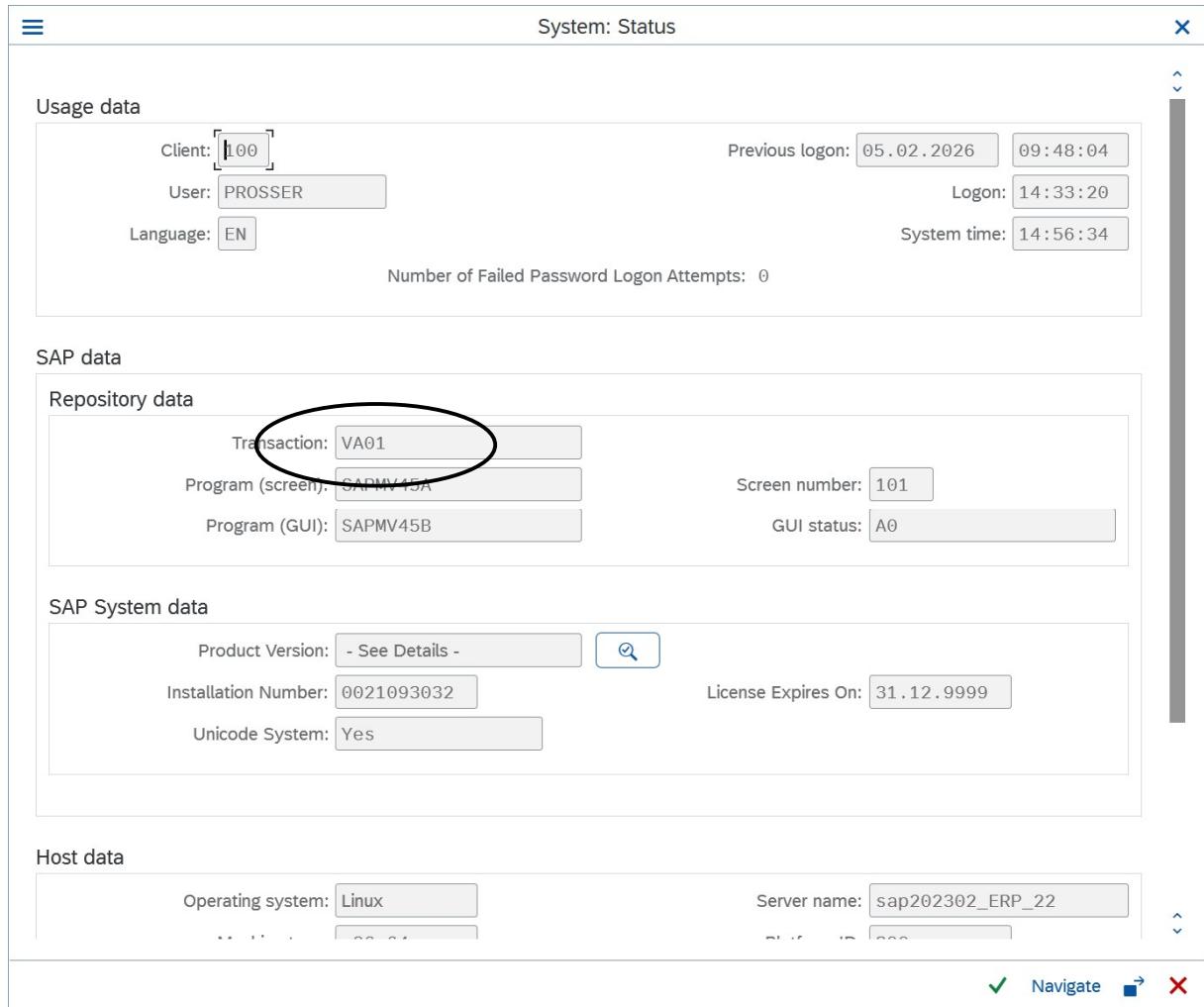


Figure 6: Status information for create order transaction (© SAP SE)

System: Status

Usage data

Client: 100	Previous logon: 05.02.2026 09:48:04
User: PROSSER	Logon: 14:33:20
Language: EN	System time: 14:54:46

Number of Failed Password Logon Attempts: 0

SAP data

Repository data

Transaction: VA02	Screen number: 4001
Program (screen): SAPMV45A	Screen number: 4900
Program (Subdynpro): SAPMV45A	GUI status: U
Program (GUI): SAPMV45B	

SAP System data

Product Version: - See Details -	<input type="button" value="🔍"/>
Installation Number: 0021093032	License Expires On: 31.12.9999
Unicode System: Yes	

Host data

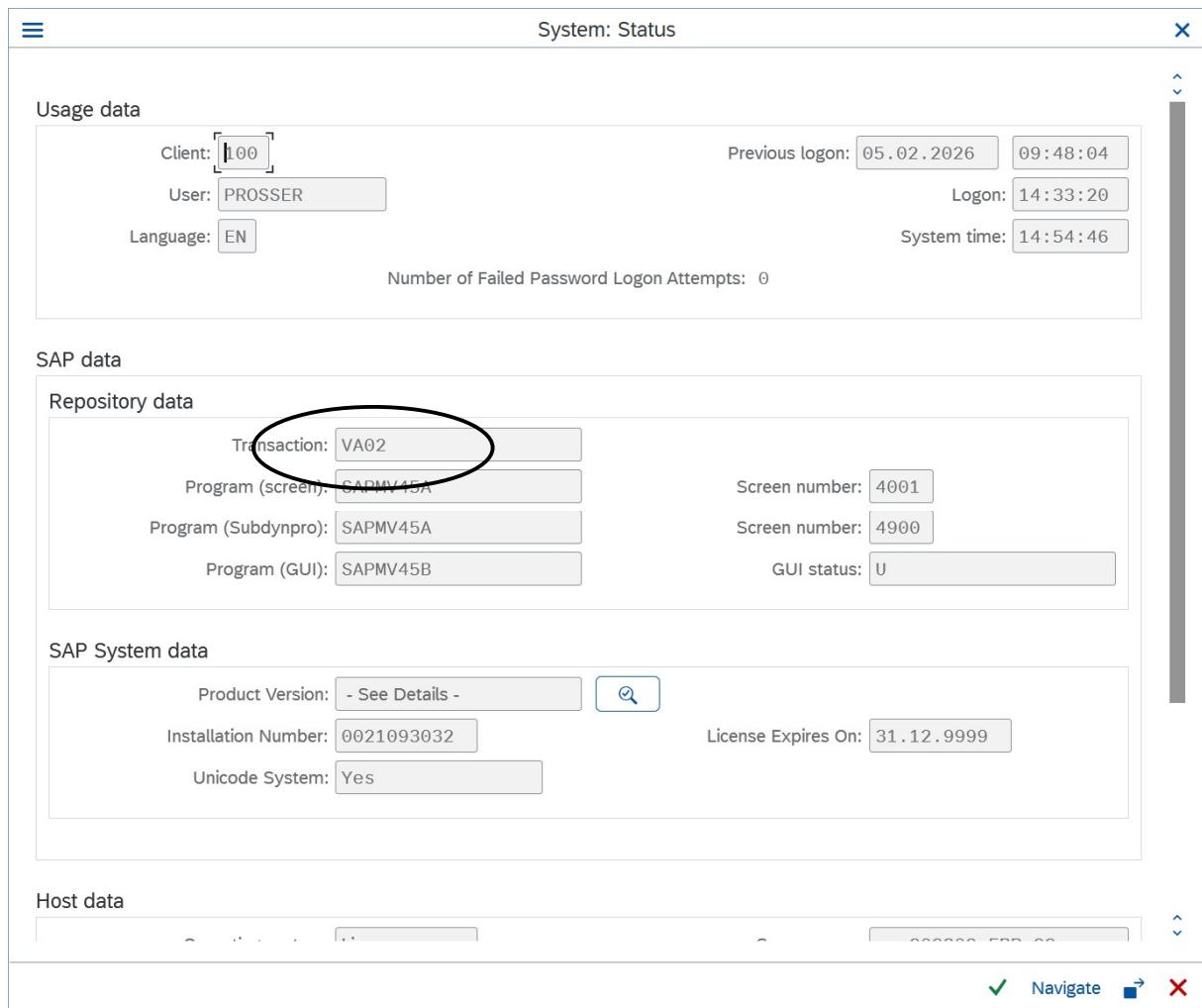


Figure 7: Status information for change order transaction (© SAP SE)

3. The DFM

This gives the following DFM:

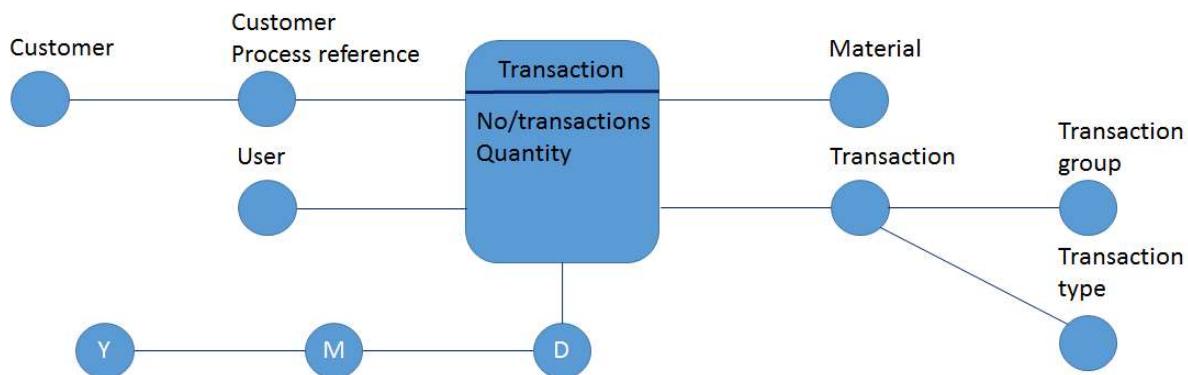


Figure 8: DFM Process Mining

Note that there is a parallel hierarchy: The transactions are grouped by the transaction type (create, change, display) and the transaction group (quotation, order, delivery). Therefore there is a parallel hierarchy. Individual transactions are grouped into a customer process reference, which is in turn grouped into customers.

4. Implementation

You find the data for this case study on the same page, where you downloaded this file from (zip archive). Use BEx to answer the following questions:

1. Quotes should not be changed once issued. Did this occur in a relevant number of cases and are there any discernible patterns when this occurs. Provide an analysis.
2. The same question applies to orders ...
3. ... and to deliveries.
4. Are there significant and regular changes in the quantity offered and the quantity ordered for a process reference?
5. Transaction VL01NO (Delivery w/o order) occurred regularly? By which users? For certain materials? Quantity framework?