QPR ProcessAnalyzer

How the product works

Agenda

Material for ~6-8 hours training with hands-on exercises

- Preliminaries
  - Introductions
  - Making sure that the environment works
- Introduction to Automatic Business Process Discovery (ABPD)
  - Why ABPD: application areas
  - How: the analysis process
  - Focus: the scope of this training
- Architecture of QPR ProcessAnalyzer
- Starting QPR ProcessAnalyzer
  - Basic concepts
  - Data: format and import
- Discovery and Filtering
  - Flowchart and Path
  - Creating Filters
- Analysis
  - Profiling
  - Influence
  - Bottleneck analysis
  - Drill-in: cases and events
- Keeping on track with things (1)
  - Filter management
  - Bookmarks
- Distributing the results
  - Web interface
- Keeping on track with things (2)
  - Models and Projects, Export
  - User management and user rights
- Enrichment - advanced example
  - Export cases
  - Import new case attribute
- Exercises & Further Information

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Introduction

Automatic Business Process Discovery and QPR ProcessAnalyzer

Traditional world meets automated discovery

Traditional world

Workshops

Subjective ’as-wish’
Time consuming
Vulnerable to human interpretation

Automated discovery

ABPD

Automated Business Process Discovery

Exact ’as-is’ process flowchart
Instant process insight
Captures process metrics
Uses facts stored in IT systems

Combine both for optimized result

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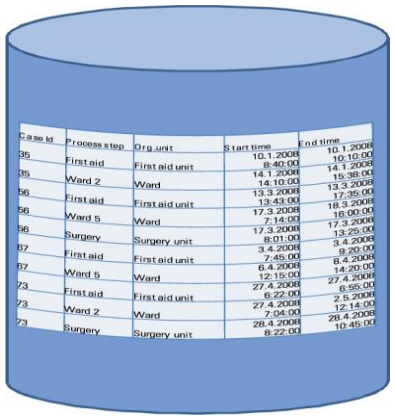
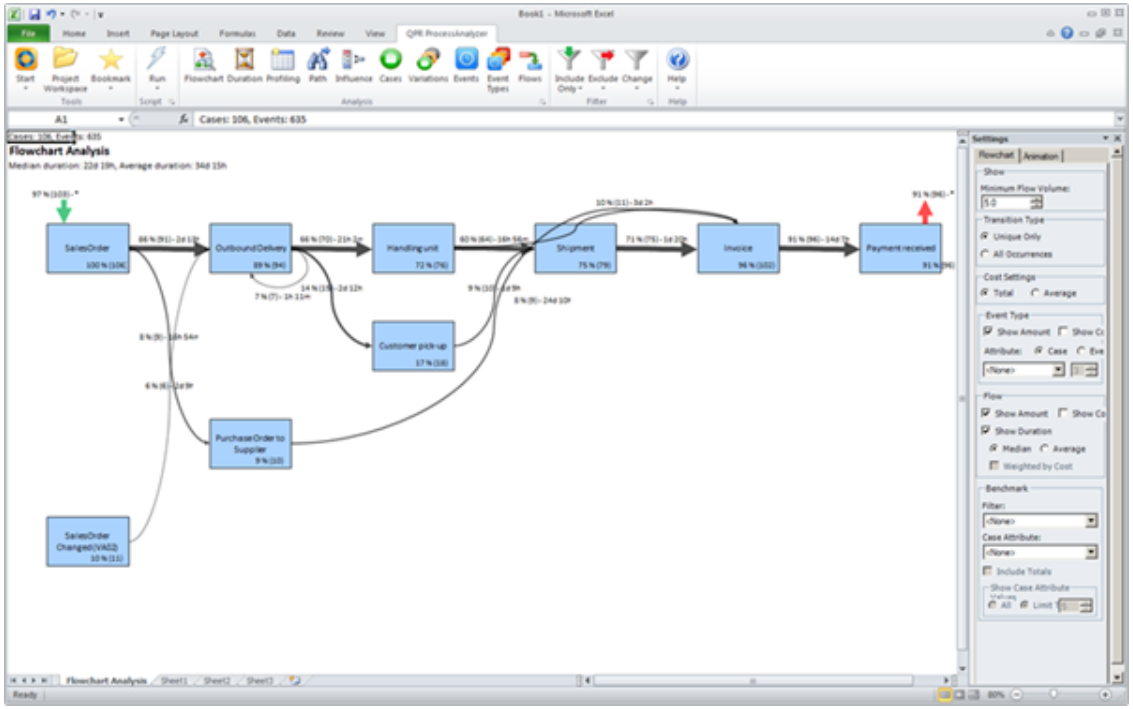
Automated Business Process Discovery

- Automated Business Process Discovery (ABPD) is a method for analyzing and visually representing processes based on data stored in log files
  - Automatically draws process charts and shows process variations
  - Shows resource use over time and in different process steps
  - Visualizes flows using advanced techniques
  - Shows congestions and bottlenecks
  - Allows drill-down to individual cases



Case Id	Process step	Org unit	Start time	End time
35	First aid	First aid unit	10.1.2008 8:40:00	10.1.2008 10:10:00
35	Ward 2	Ward	14.1.2008 14:10:00	14.1.2008 15:38:00
56	First aid	First aid unit	13.3.2008 13:43:00	13.3.2008 17:35:00
56	Ward 5	Ward	17.3.2008 7:14:00	18.3.2008 16:00:00
56	Surgery	Surgery unit	17.3.2008 18:01:00	17.3.2008 13:25:00
67	First aid	First aid unit	3.4.2008 7:45:00	3.4.2008 8:20:00
67	Ward 5	Ward	6.4.2008 12:15:00	8.4.2008 14:20:00
73	First aid	First aid unit	27.4.2008 8:22:00	27.4.2008 8:55:00
73	Ward 2	Ward	27.4.2008 7:04:00	2.5.2008 12:14:00
73	Surgery	Surgery unit	28.4.2008 8:22:00	28.4.2008 10:45:00



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Application areas

Process improvement

- Reduce costs
- Recude variations and deviations
- Improve productivity
- Reduce lead times
- e.g. LEAN, Six Sigma etc.

Regulatory compliance

- Conformance
- Internal auditing

Enterprise Architecture

- System redocumentation
- Baseline analysis

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Deliverables and benefits

Deliverable	Contents	Benefits
Business Process models	How activities are performed establishing end-to-end processes	Understand current processes, identify best practice, identify problems and bottlenecks, improve processes.
Organizational models	How various organizational units co-operate	Understand and improve cross-organizational co-operation, remove bottlenecks.
IT System documentation	Show how various IT systems are actually used during the process	Document and validate IT system usage, educate users, develop IT systems.
Performance metrics	Basic measures including processing times, waiting times	Review performance, set clear goals and manage improvement initiatives.
Segment Analysis	Comparison reports showing the differences between selected segments	Understand segments and improve segment-specific procedures.

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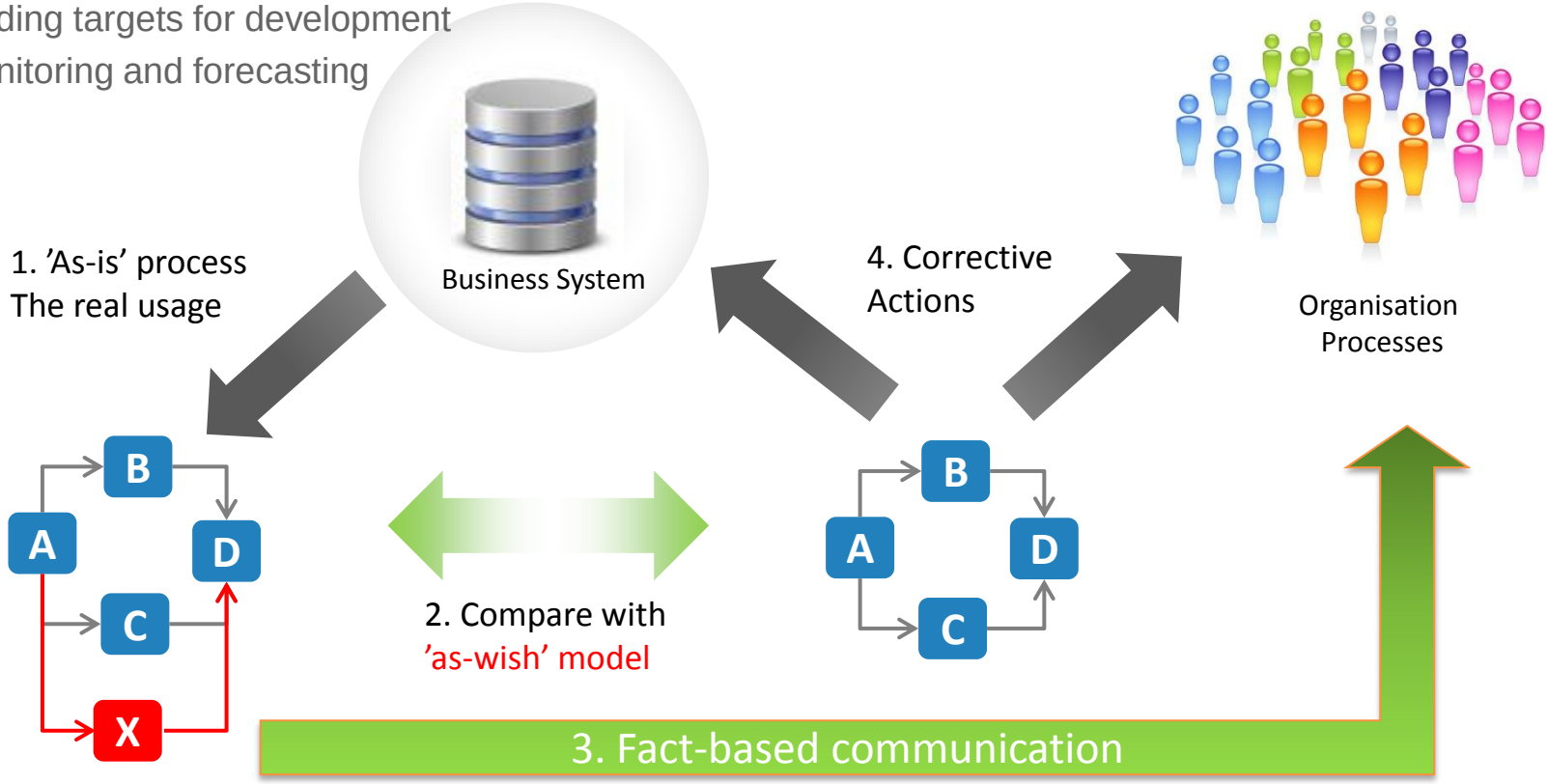
Supports fact-based communication and process management

- QPR ProcessAnalyzer provides
  - *quantitative facts about the process* - compared with opinions or qualitative assessments
- Use the information in:
  - Coaching the organization
  - Finding targets for development
  - Monitoring and forecasting



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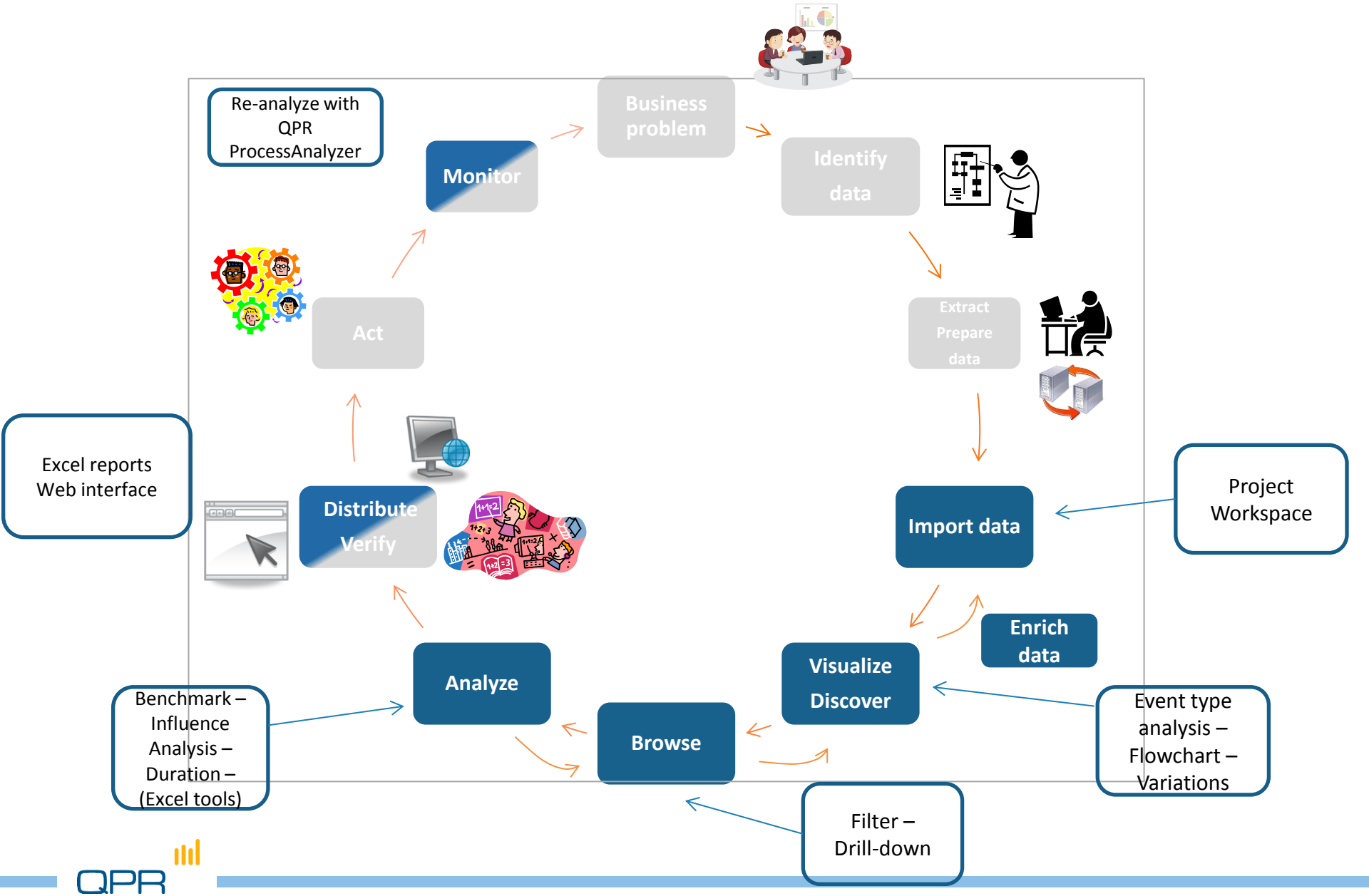
Focus of the training

QPR ProcessAnalyzer and Business Process Management

QPR ProcessAnalyzer and the analytical BPM cycle



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Focus of the training

system(s)

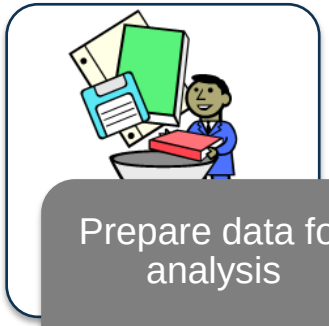
CRM

SRM

Focus of this training

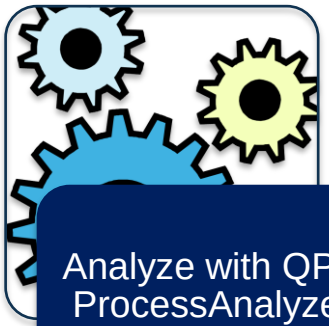
Extract transaction data from business system(s)

- Flat file
- ODBC
- OLAP
- SQL



Prepare data for analysis

- ETL Tools
- Database scripts
- Excel
- Profiling, Cleansing



Analyze with QPR ProcessAnalyzer

Filter

Enrich

Analyze

Create and distribute analysis reports

Excel report distribution

QPR ProcessAnalyzer Web interface

ERP

SCM

ETL

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Steps in more detail

Business problem	• Define the problem and stakeholders • Translate the business questions into analysis questions
Identify data	• Scope the analysis in technical sense • Find relevant data in source systems • Find key experts and documents
Extract data	• Extract the data from the source system, and • Load it into preparation environment
Prepare data	• Prepare the data for QPR ProcessAnalyzer by transformation to Cases, Events and Attributes that match the analysis questions
Import data	• Import Event and Case data into QPR ProcessAnalyzer
Process analysis	• Validate the quality, completeness, and relevance of the data and transformations • Discover - Browse - Filter - Drill-in - Examine Cases - Analyze • Enrich the data by creating new attributes
Verify	• Check that the results are adequate from the organization, source system, and reporting systems
Distribute	• Distribute the results of the analysis (Excel reports & web interface)
Act	• Plan and implement beneficial **actions** for business process
Monitor	• Follow the effect of the the actions by repeating the analysis cycle using QPR ProcessAnalyzer and/or by other means

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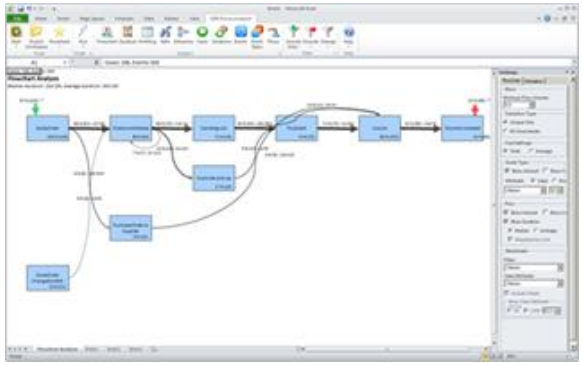
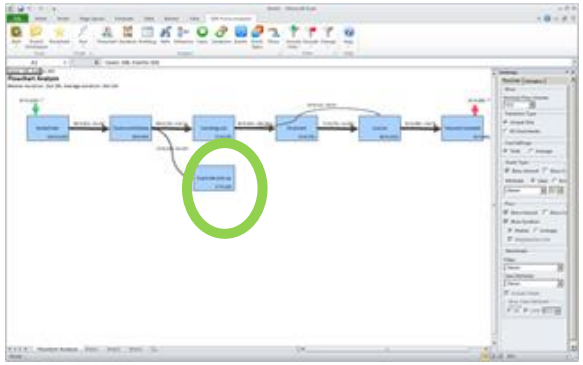
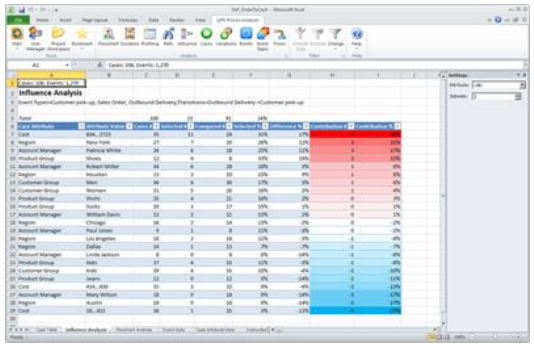
Summary

- Helicopter-view **discovery**
  - The **actual process visualized** based on your data
  - See relevant **metrics in process context**
- Process **details** and **analysis**
  - Interactive browsing, filtering, selection
  - Viewpoints into bottlenecks, variations and deviations
  - Drill-down, case-based reasoning
- Fact-based **communication** means
  - Discovery of the problem areas of the process, based on the data → **no longer speculative**
  - Distribute the results to organization







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QPR ProcessAnalyzer in practice

Example of Order-to-Cash analytics

Scoping:
Order-to-Cash process

Scope business problem
Identify data

Organization

Sales | Service | Delivery | Finance

1. Order

2. Delivery & payment

Extract data

CRM | ERP | Finance

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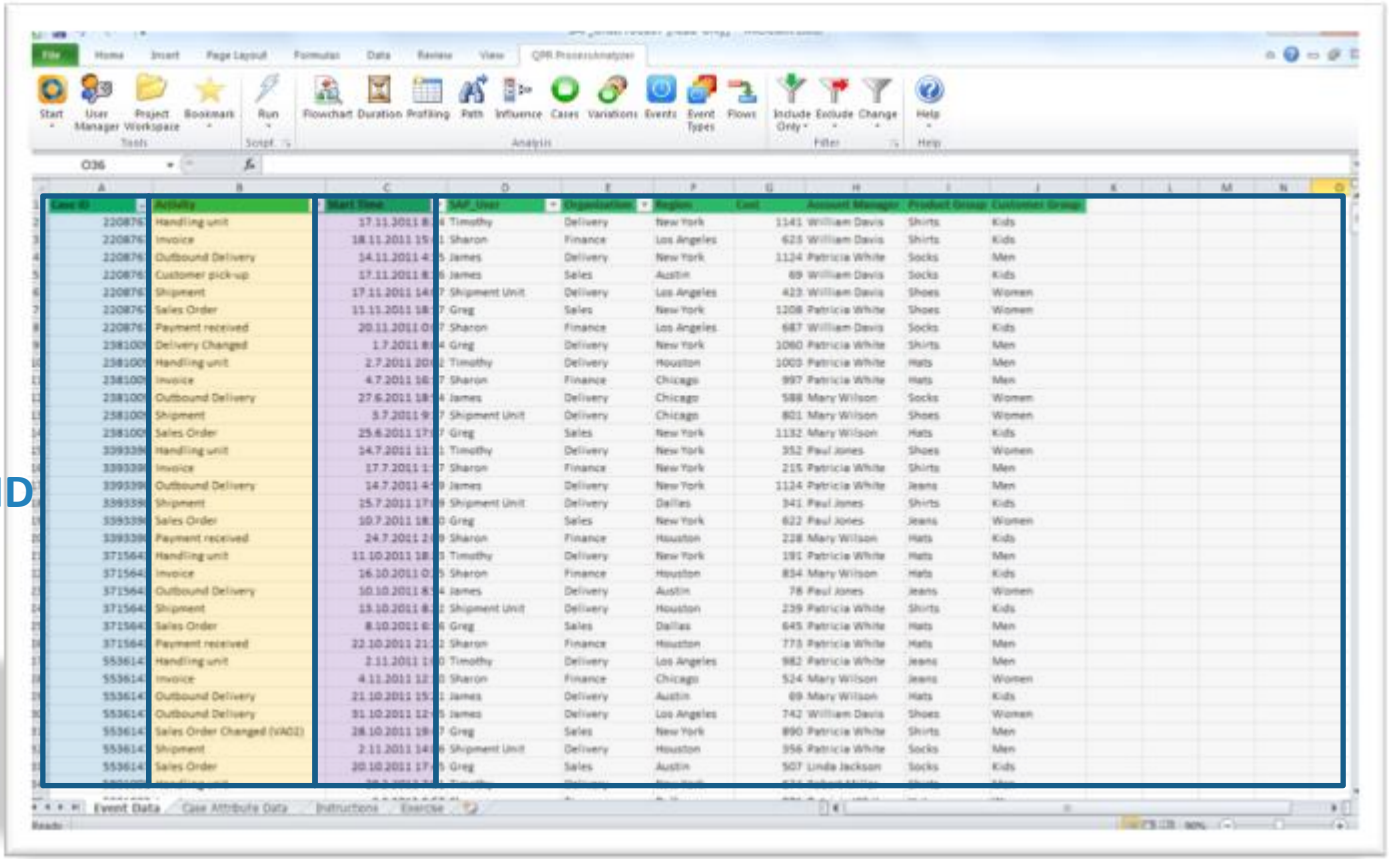
Import data



Case ID

Event type (activity name)

Timestamp

Optional: attributes, e.g. product group, organization unit, site, resources

- Note: MS Excel can show up to 1 million rows.

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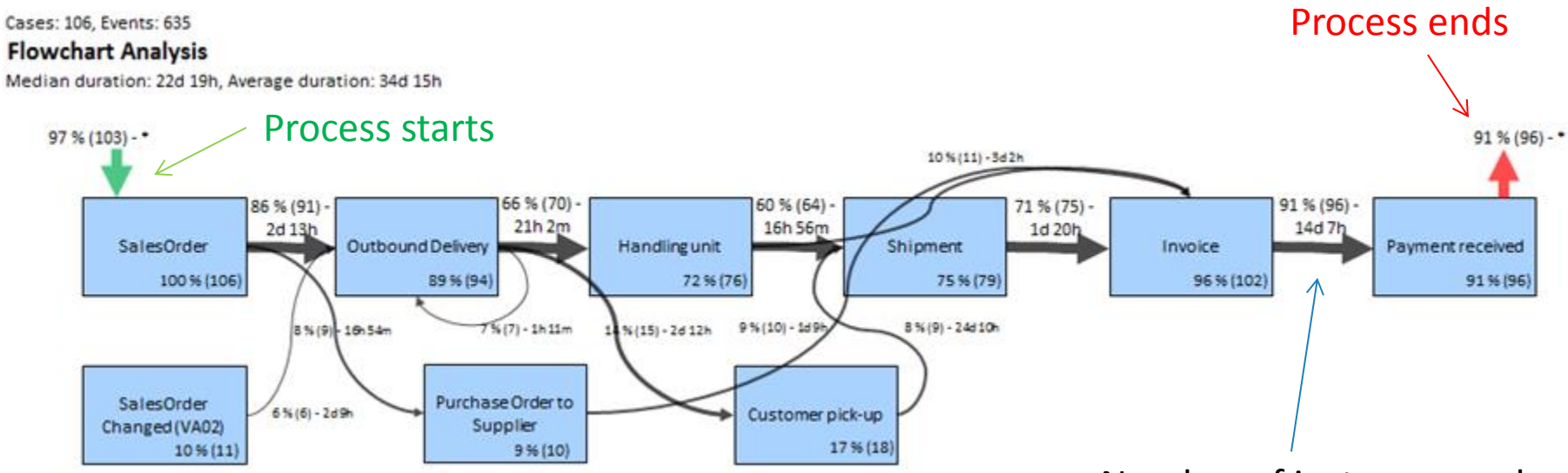
Visualize – Discover - Select



Number of instances through this specific event type

Number of instances and median time between events

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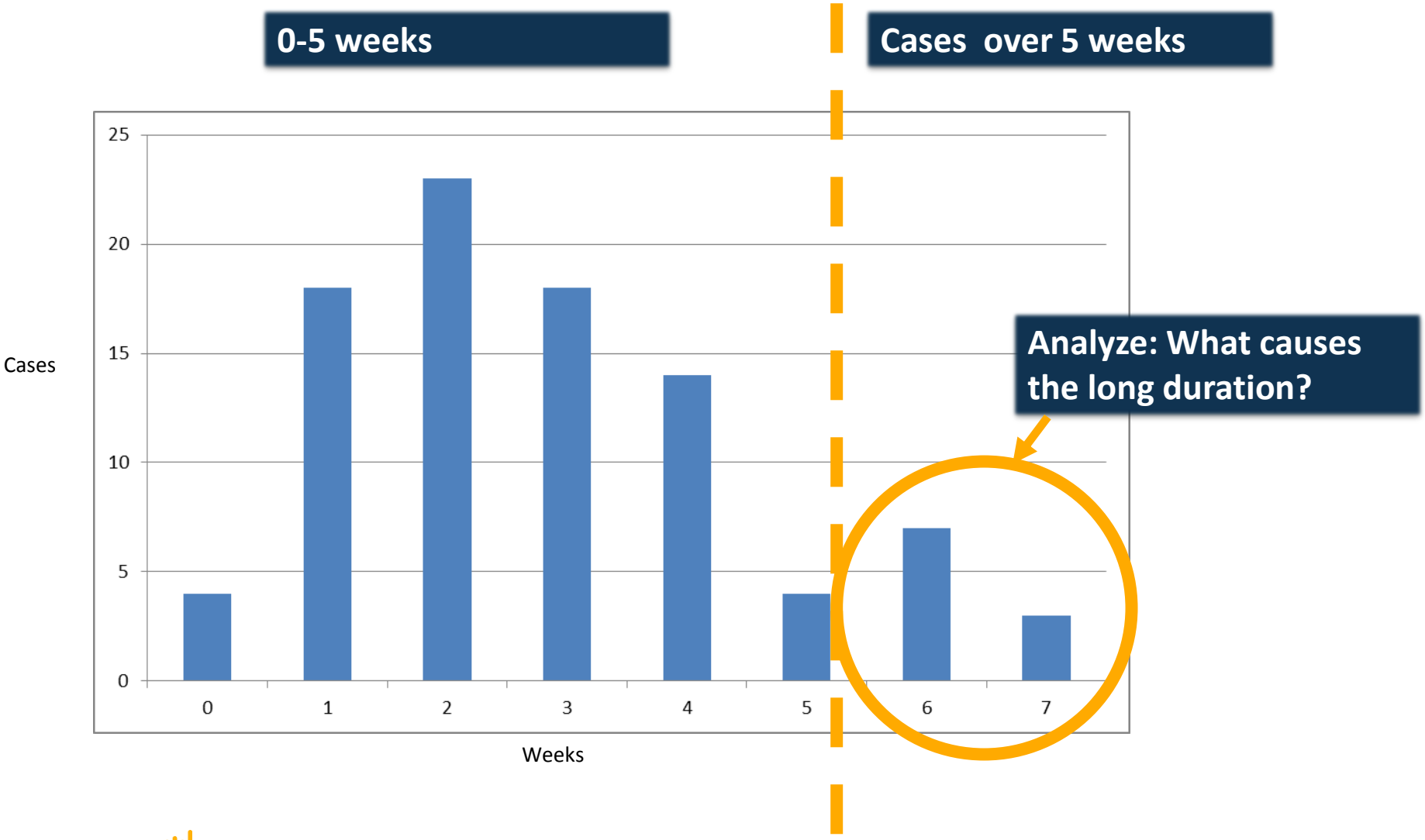
Select - Analyze



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Root causes

Long duration occurs frequently

Influence Analysis

Event Types=Purchase Order to Supplier

Case Attribute	Attribute Value	Cases #	Selected #	Compared #	Selected %	Difference %	Contribution #	Contribution %
Total		*106*	*10*	*96*	*9 %*			
Product Group	Jeans	12	6	6	50 %	41 %	5	49 %
Region	Austin	18	4	14	22 %	13 %	2	23 %
Account Manager	Linda Jackson	8	2	6	25 %	16 %	1	12 %
Customer Group	Men	36	4	32	11 %	2 %	1	6 %
Region	New York	27	3	24	11 %	2 %	0	5 %
Account Manager	Mary Wilson	18	2	16	11 %	2 %	0	3 %
Account Manager	Paul Jones	9	1	8	11 %	2 %	0	2 %
Customer Group	Women	31	3	28	10 %	0 %	0	1 %
Account Manager	Robert Miller	34	3	31	9 %	-1 %	0	-2 %
Account Manager	Patricia White	24	2	22	8 %	-1 %	0	-3 %
Cost	414...830	35	3	32	9 %	-1 %	0	-3 %
Region	Dallas	14	1	13	7 %	-2 %	0	-3 %
Product Group	Shirts	25	2	23	8 %	-1 %	0	-4 %
Cost	18...413	36	3	33	8 %	-1 %	0	-4 %
Region	Chicago	16	1	15	6 %	-3 %	-1	-5 %
Customer Group	Kids	39	3	36	8 %	-2 %	-1	-7 %
Region	Los Angeles	18	1	17	6 %	-4 %	-1	-7 %
Product Group	Shoes	12	0	12	0 %	-9 %	-1	-11 %
Region	Houston	13	0	13	0 %	-9 %	-1	-12 %
Product Group	Hats	37	2	35	5 %	-4 %	-1	-15 %
Product Group	Socks	20	0	20	0 %	-9 %	-2	-19 %

Neutral relation

Long duration occurs infrequently

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Architecture

- QPR ProcessAnalyzer Xpress
- QPR ProcessAnalyzer Database
- QPR ProcessAnalyzer Pro

QPR ProcessAnalyzer product options

- **QPR ProcessAnalyzer Xpress**
  - The stand-alone version
- **QPR ProcessAnalyzer Pro**
  - Uses a QPR ProcessAnalyzer web service
- **QPR ProcessAnalyzer Database**
  - Uses a direct database connection to an MS SQL Server

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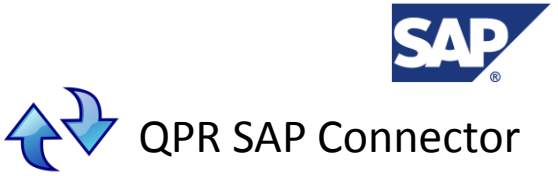
QPR ProcessAnalyzer Xpress

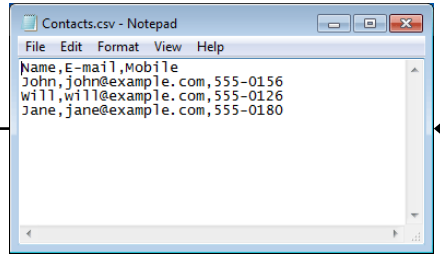


QPR SAP Connector

WINSHUTTLE™

Excel UI, import and reporting

Text file

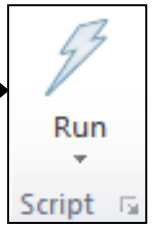


Standalone workstation

QPR PA Excel Client

SQL core

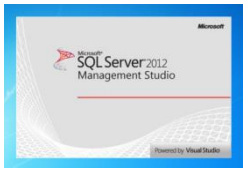
QPR PA Database
Microsoft SQL Server LocalDb



ImportSalesforceQuery

BULK IMPORT

Custom reports



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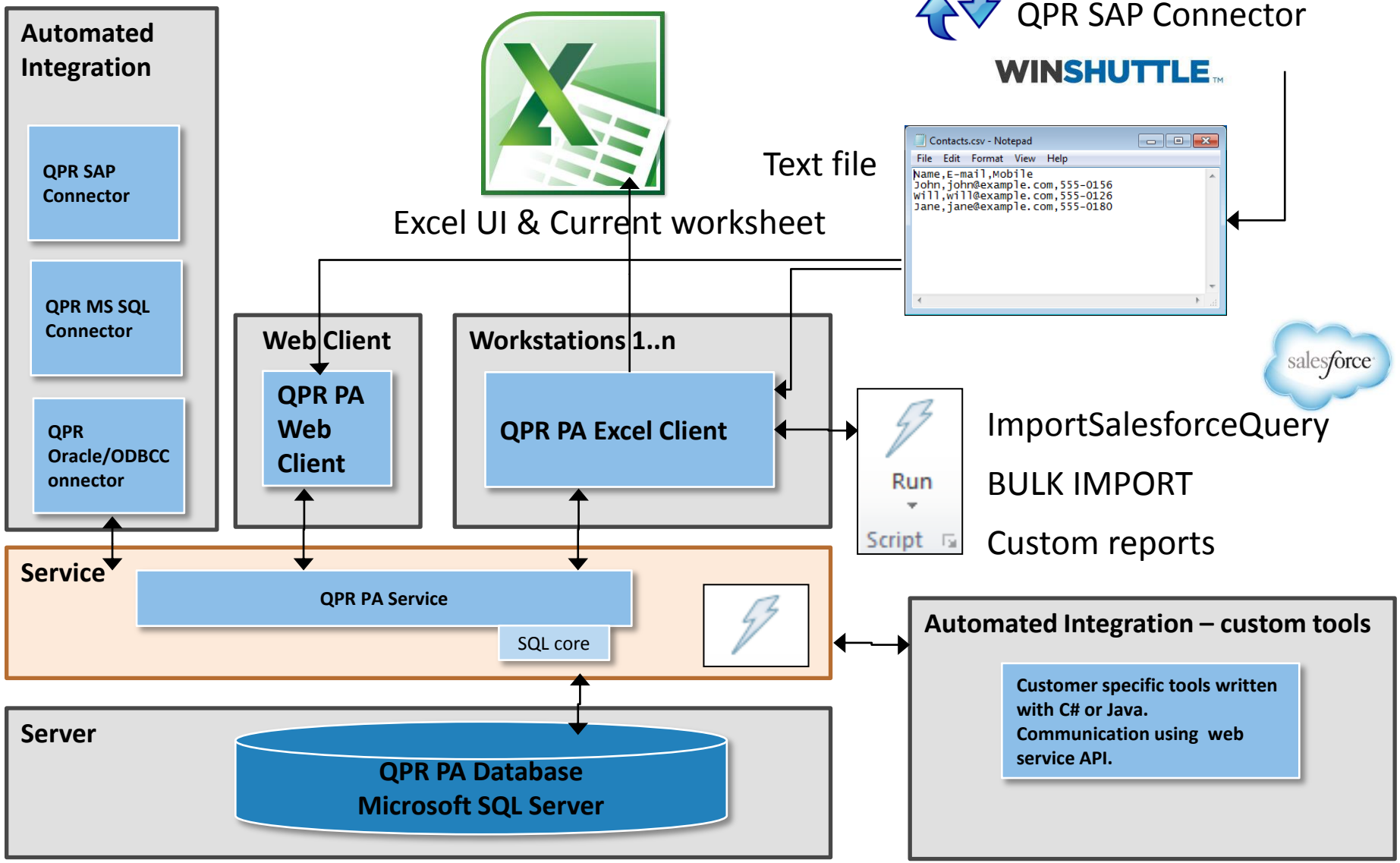
QPR ProcessAnalyzer Pro



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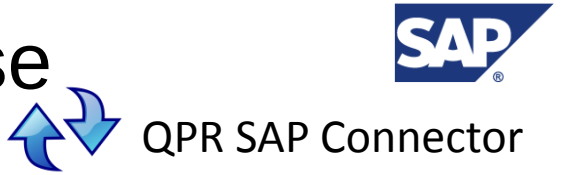
QPR ProcessAnalyzer Database

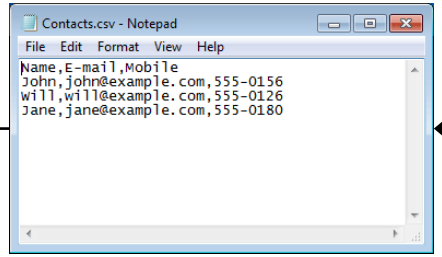


QPR SAP Connector

WINSHUTTLE™

Excel UI, import and reporting

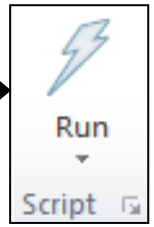
Text file



Workstations 1..n

QPR PA Excel Client

SQL core



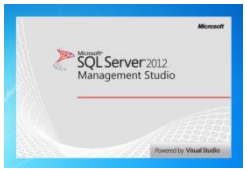
ImportSalesforceQuery

BULK IMPORT

Custom reports

Server

QPR PA Database
Microsoft SQL Server



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Getting started

Starting QPR ProcessAnalyzer
Loading the data
Creating a model

Explore, ask, analyze, show!

- QPR ProcessAnalyzer is an interactive ABPD tool for ”making questions and finding answers” on process data by
  - **exploring (discovering, visualizing, and browsing)** the process in a holistic, visual way
  - **making analysis** on process features and causal relations
  - **drilling into details**
- Analysts’ business is to
  - obtain appropriate data in right format
  - find out and state the relevant ”questions for data”
  - find the answers by using QPR ProcessAnalyzer
  - come up with more questions and findings
  - help stakeholders and other experts to understand the results

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Functions needed to get started

Log in / out
View session information and operation log

Select project / process model
Import data from Excel sheets to ProcessAnalyzer

WIKI (user manual)
Demo data
Version information
Product activation

Change password
User management

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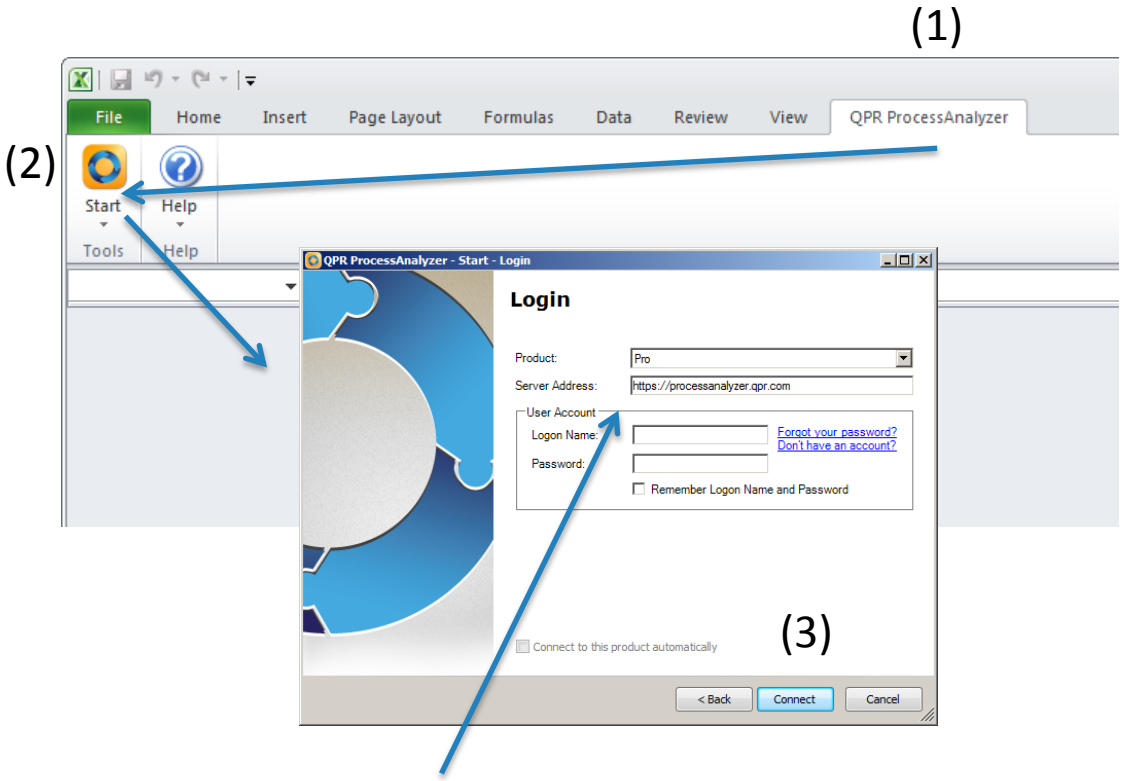
Start

- Excel add-in starts from the tab (1)
- Select ”Start” to give your credentials either as a Pro (= the cloud service) or Xpress user (= the standalone version)
- If you use the Xpress version, product activation is first required
- For logging out, select Start > Logout



Default address for the web service (in Pro version)

In special configurations the address may be different

- Tip: In certain circumstances MS Office may deactivate add-ins. If the tab for already installed ProcessAnalyzer disappears, check the status of QPR ProcessAnalyzer add-in from MS Office Excel options.

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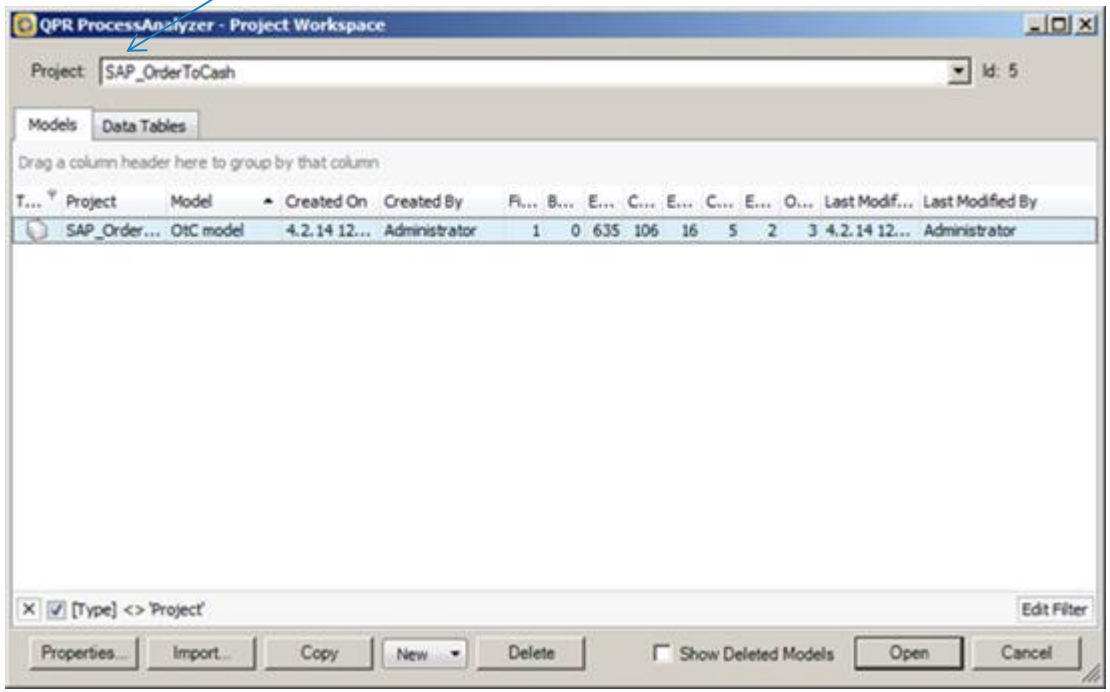
Start

- The Excel add-in connects to the QPR ProcessAnalyzer service. Once the connection is established successfully, the Project Workspace dialog appears. (Note that the contents of the listed projects may vary from the screenshot below.)
- Click ”Open” to open the highlighted model or ”Cancel” to proceed without opening.

Active project (collection of process analysis models)

Available models



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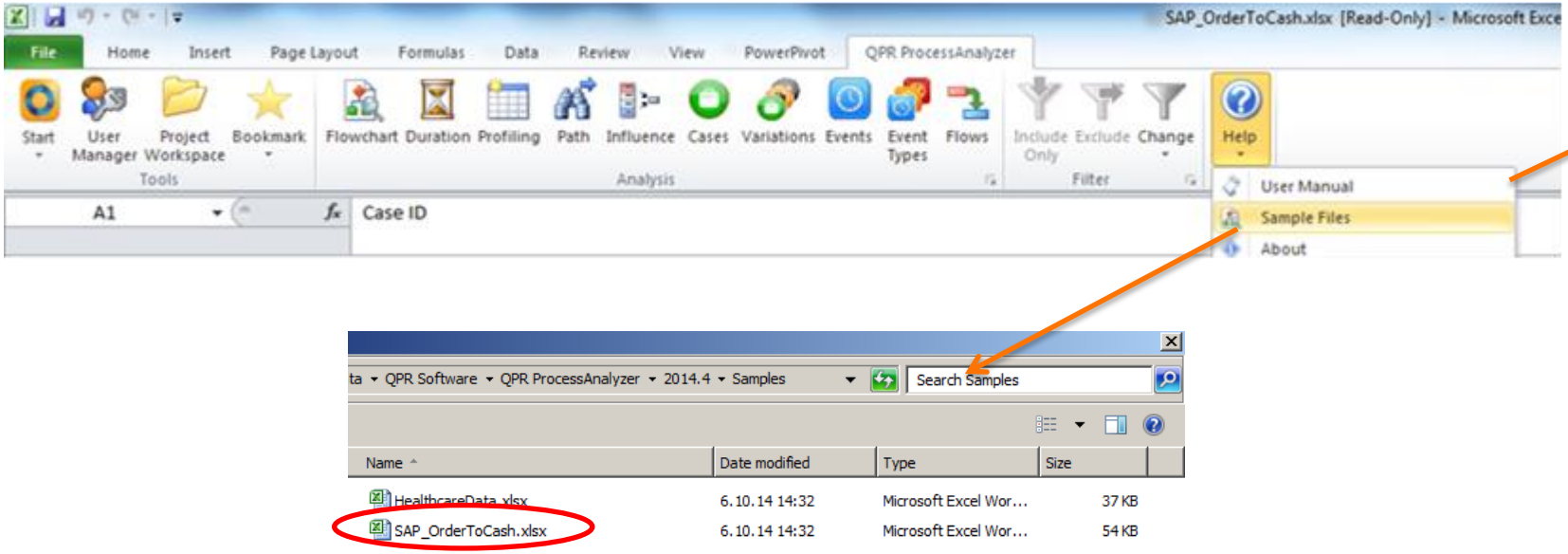
Getting demo data



- Let's start with built-in sample file for OtC process
- Select "Help" from ribbon and load Sample file "SAP_OrderToCash"
  - Tip: for documentation & instructions refer to QPR ProcessAnalyzer Wiki
  - Wiki opens from "User Manual"
- In the Excel file:
  - Event data, Case data
  - Short instructions
  - Exercise questions

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Cases and Event types, Events, and Timestamps

Relation of QPR ProcessAnalyzer data and process visualization

Summary of QPR ProcessAnalyzer data concept

Event data

(compulsory)

The process:

How did this case proceed?

A sequence of Events

Data

Multiple rows for each Case

Optional Event attributes apply to individual events

Case data

(optional)

The explanations:

What is this case?

A set of Case attributes

Data

One row for a Case

Attributes describe the complete case

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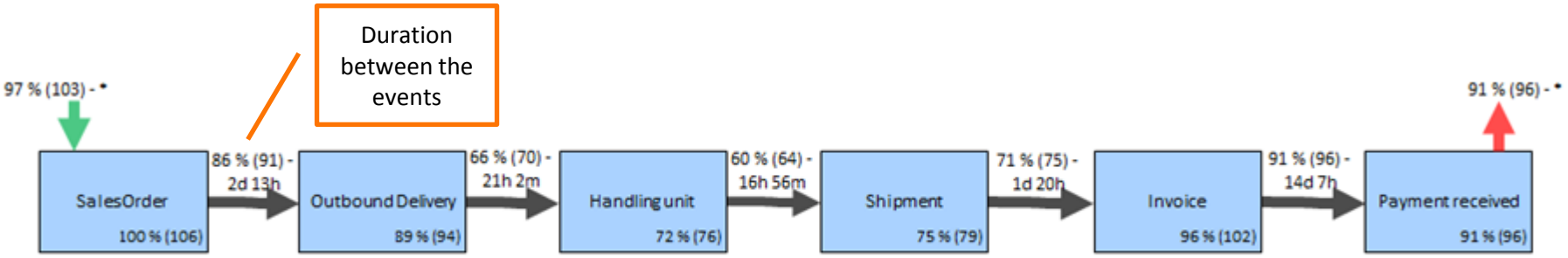
A case is a sequence of events



Case	Event Type	Start Time
114483567	Sales Order	24.5.11 02:25
79545494	Sales Order	24.5.11 09:38
61426559	Sales Order	24.5.11 21:59
2003679498	Sales Order	25.5.11 09:03
884989895	Sales Order	26.5.11 16:09
2003679498	Outbound Delivery	27.5.11 02:31
79545494	Outbound Delivery	27.5.11 03:31
114483567	Outbound Delivery	27.5.11 04:21

Event data with timestamps

- **Event type** = name of an event (”activity name”)
- **Event** = specific event with a timestamp
- **Duration** = time between successive event timestamps
- There is only one timestamp associated with an activity
  - Tip: if the start and end times of an activity are of importance, code them as two events e.g. Sales Order (start) / Sales Order (end)

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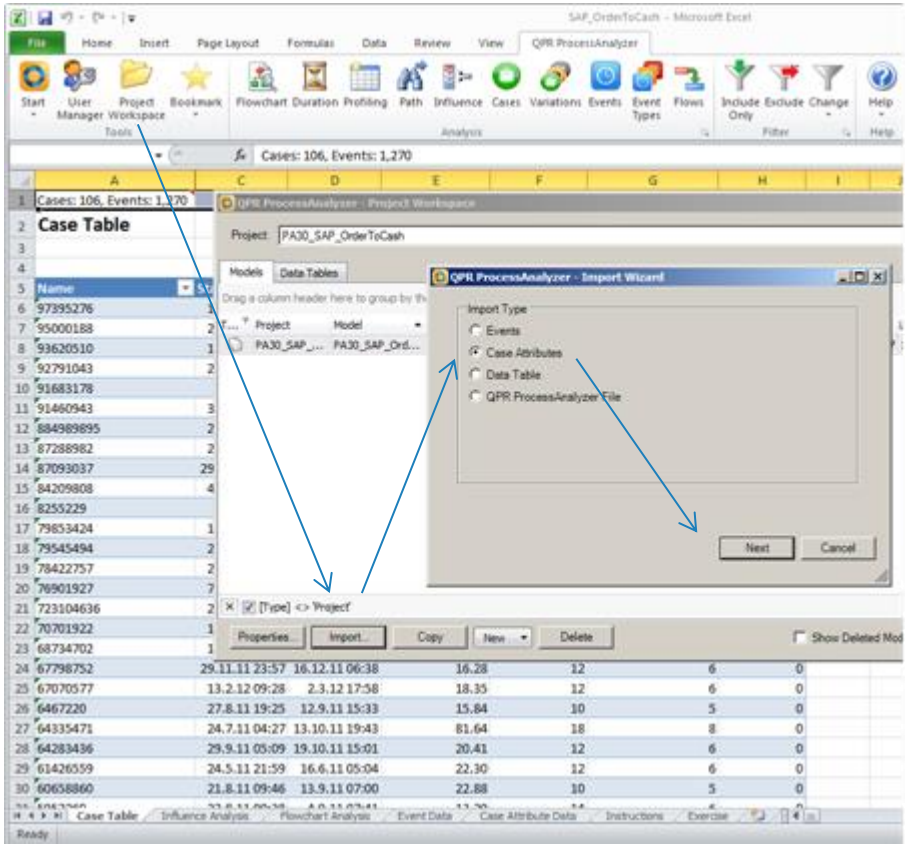
Import

Import data from Excel sheets

- Open ”Project Workspace”
- Select ”Import”
  - Note: what is in the project/model list is not of importance here
- Select Events, Case Attributes or Data Table
  - Example figure applies to ”Case Attributes”
- The fourth radio button ”QPR ProcessAnalyzer File” is meant for Exported Model
  - see Wiki



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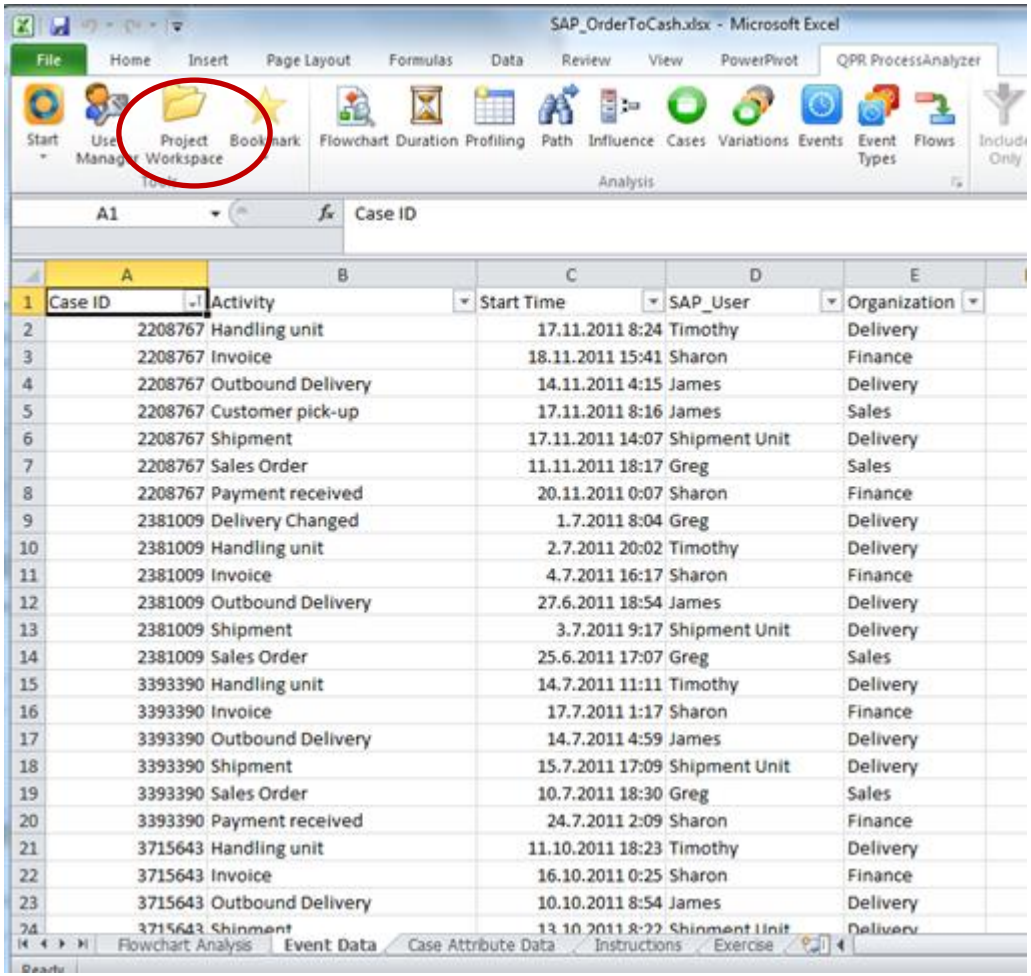
(1) Import Events and Event attributes

- Select the sheet with Events and Event attributes
- Select ”Project Workspace”
  - Note: what is in the project/model list is not of importance here...



Case ID	Activity	Start Time	SAP_User	Organization
2208767	Handling unit	17.11.2011 8:24	Timothy	Delivery
2208767	Invoice	18.11.2011 15:41	Sharon	Finance
2208767	Outbound Delivery	14.11.2011 4:15	James	Delivery
2208767	Customer pick-up	17.11.2011 8:16	James	Sales
2208767	Shipment	17.11.2011 14:07	Shipment Unit	Delivery
2208767	Sales Order	11.11.2011 18:17	Greg	Sales
2208767	Payment received	20.11.2011 0:07	Sharon	Finance
2381009	Delivery Changed	1.7.2011 8:04	Greg	Delivery
2381009	Handling unit	2.7.2011 20:02	Timothy	Delivery
2381009	Invoice	4.7.2011 16:17	Sharon	Finance
2381009	Outbound Delivery	27.6.2011 18:54	James	Delivery
2381009	Shipment	3.7.2011 9:17	Shipment Unit	Delivery
2381009	Sales Order	25.6.2011 17:07	Greg	Sales
3393390	Handling unit	14.7.2011 11:11	Timothy	Delivery
3393390	Invoice	17.7.2011 1:17	Sharon	Finance
3393390	Outbound Delivery	14.7.2011 4:59	James	Delivery
3393390	Shipment	15.7.2011 17:09	Shipment Unit	Delivery
3393390	Sales Order	10.7.2011 18:30	Greg	Sales
3393390	Payment received	24.7.2011 2:09	Sharon	Finance
3715643	Handling unit	11.10.2011 18:23	Timothy	Delivery
3715643	Invoice	16.10.2011 0:25	Sharon	Finance
3715643	Outbound Delivery	10.10.2011 8:54	James	Delivery

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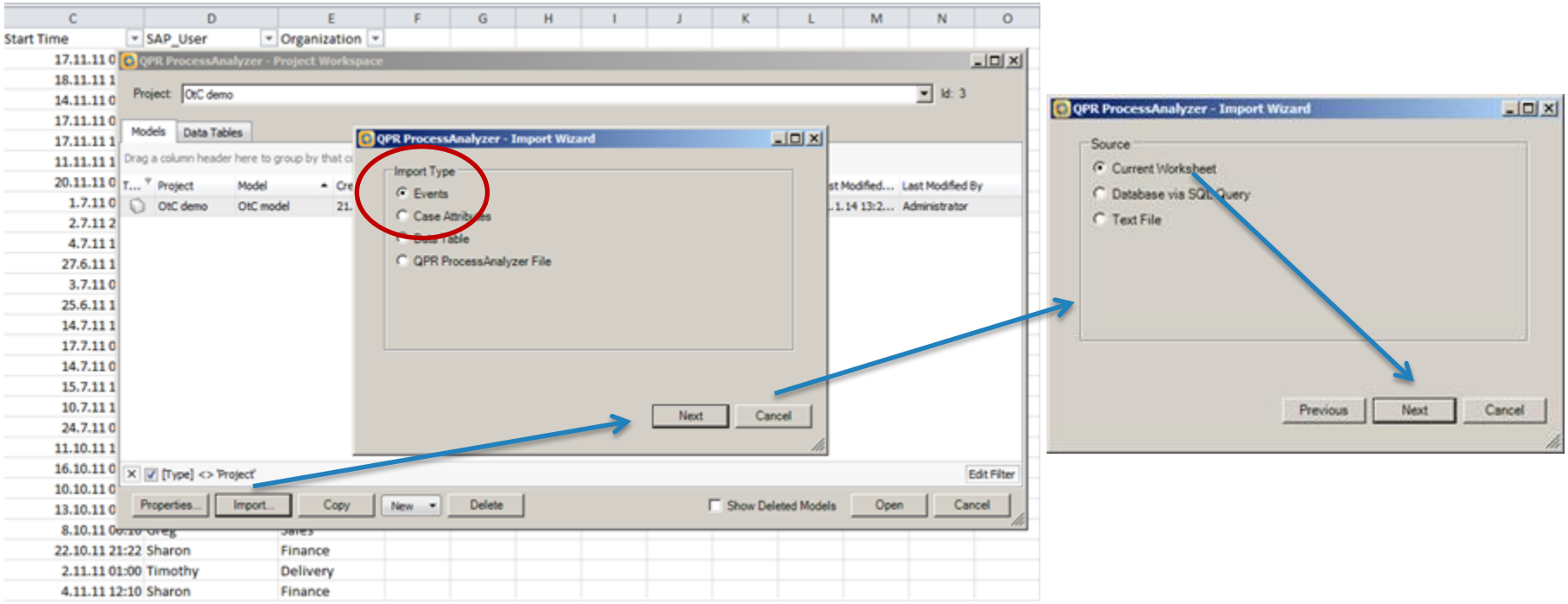
(1) Import Events and Event attributes

- Ensure that the ”current worksheet” is the one that includes the proper data!



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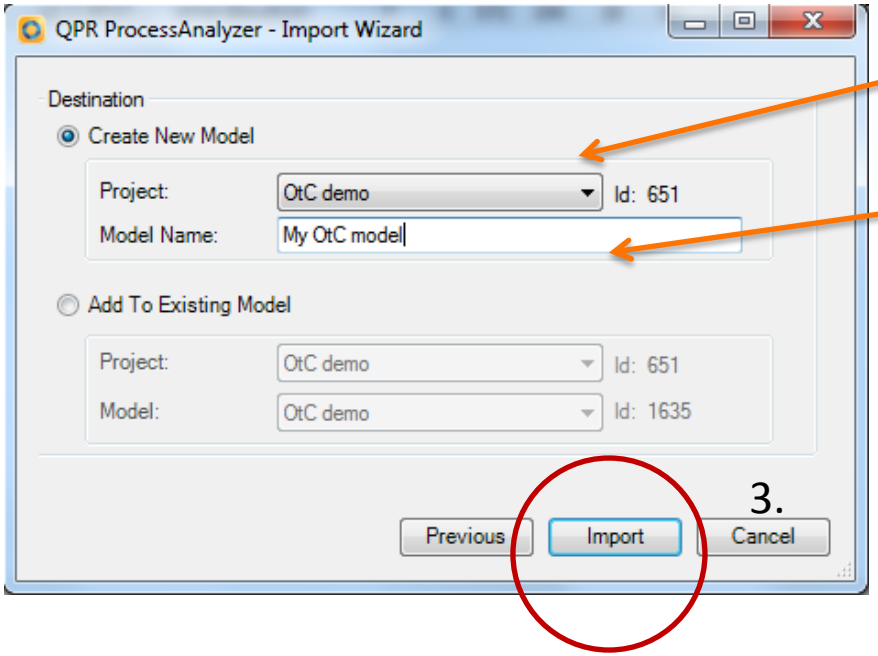
(1) Import Events and Event attributes

- Create a new model



1. Select Project. Models are organized into Projects. (You have similar access rights to all models within a project.)

2. Give a name for the model.

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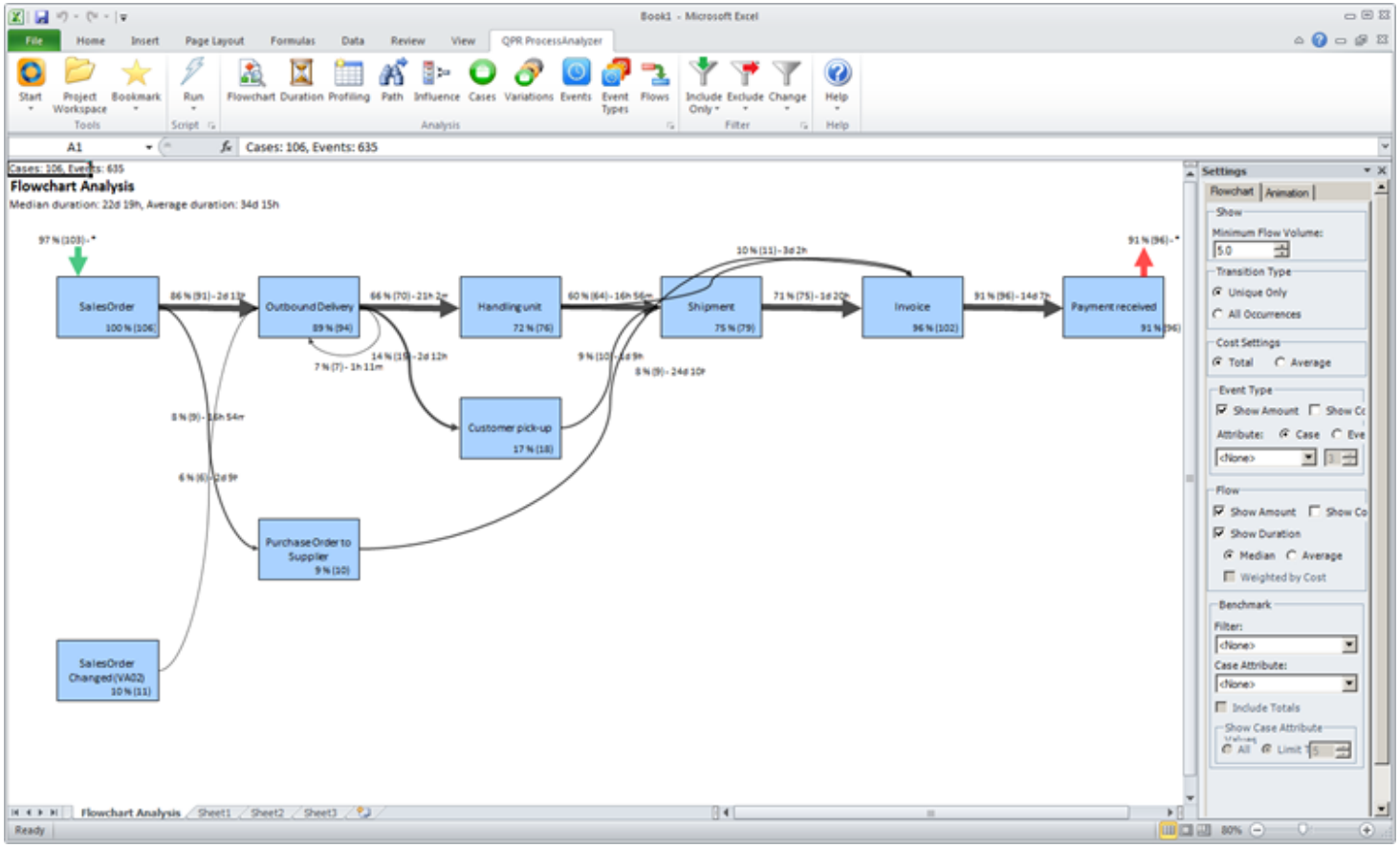
Process Model

- Your first model! QPR ProcessAnalyzer automatically renders the Flowchart Analysis



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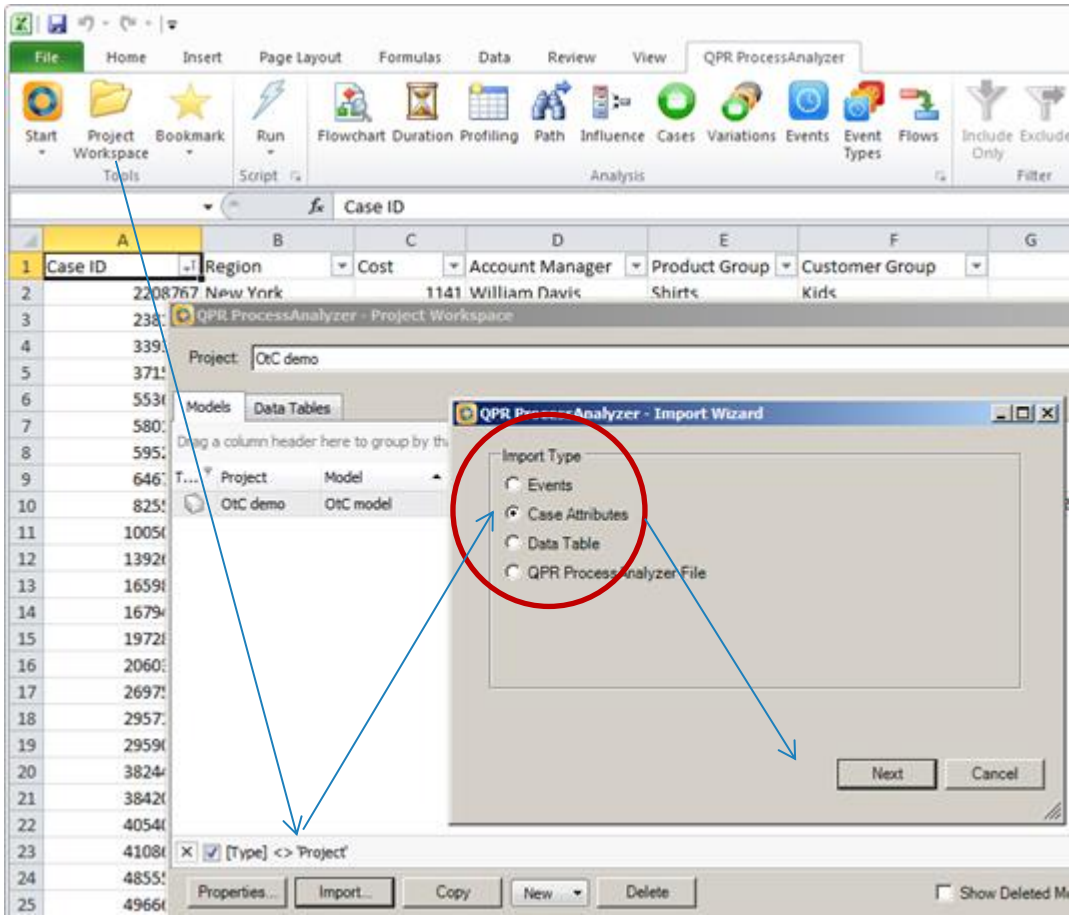
(2) Import Case attributes

- Select the sheet with Case attributes
- Select ”Project Workspace”
- Proceed as with events but remember to select ”Case Attributes”



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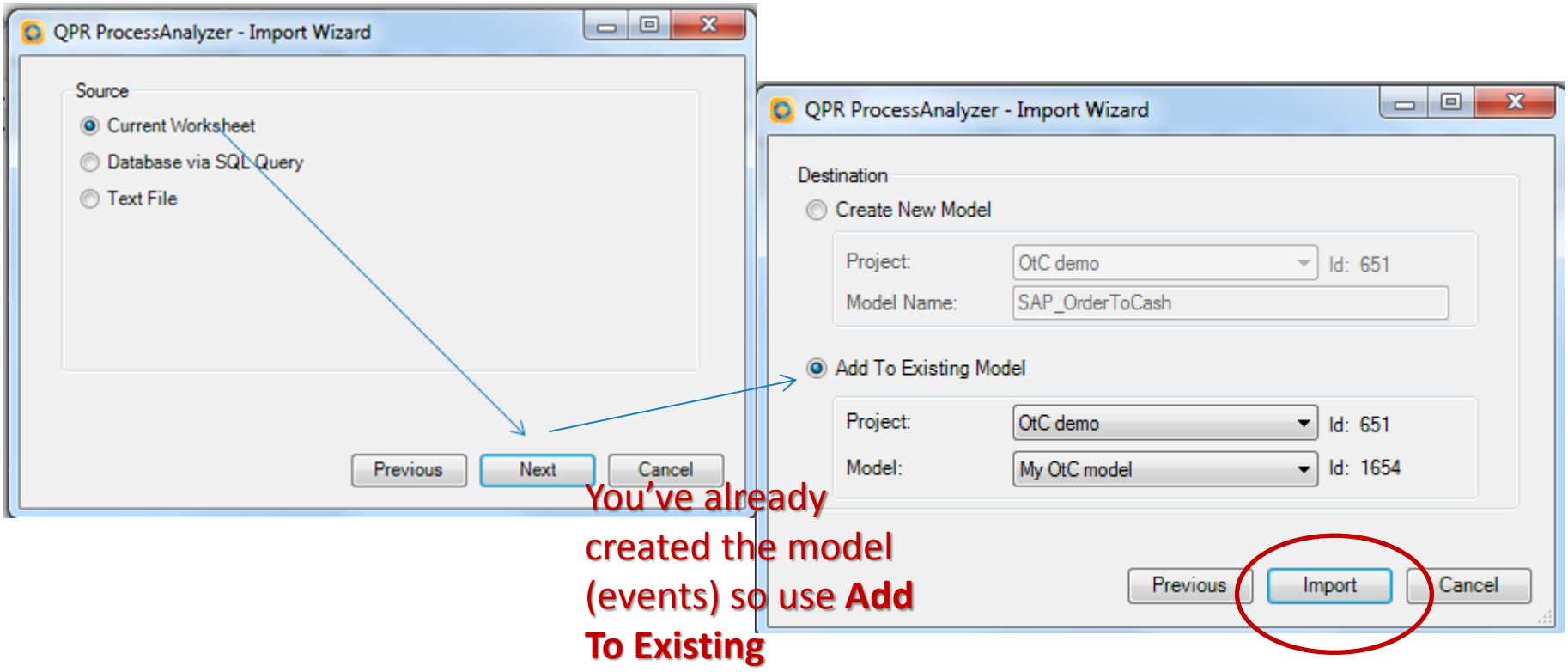
(2) Import Case attributes

- Ensure that the ”current worksheet” is the one that includes the proper data



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Details

Details and advanced features of data load and data format

Case vs. Event attributes in practice

- Conceptually
  - Case attribute refers to a complete Case
  - Event attribute refers to an individual Event
- Technically
  - An attribute can be used as a Case attribute if it can have only one value during one Case
    - Example: Opportunity creator is conceptually related only to Order creation but can be used as a Case attribute (since it can't get several values during a case)
- Current usage in analysis tools
  - *Case attributes can be used in Influence Analysis and Benchmarking, Profiling, Flowcharts, and Case Analysis functionality*
  - Currently Event attributes have more limited use: Flowcharts and Profiling
    - Note: Even if some attribute is "conceptually" associated with an event, it can be used in analytics as a Case attribute as far as the technical specification holds. That is, the attribute value must be unambiguous for one Case.

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Load data (format details)

- Event data
  - Excel sheet format
    - First line must have a header
    - First three columns are always reserved for CaseID, Event type name, and Timestamp in this order. Yet there must be a label, it may be whatever.
    - Timestamp must be in date/time format
    - There may be additional Event Attributes. Their label is taken as the labeling in Process Analyzer.
      - There is a reserved, special label ”Cost” that defines Event Cost
  - Format (CSV, MS SQL)
    - Refer to Wiki http://devnet.qpr.com/pawiki/index.php/Workspace
- Case data
  - Excel sheet format
    - First line must have a header
    - First column is always reserved for CaseID. Yet there must be a label, it may be whatever.
    - From 2nd, 3rd, ... columns are the Case attributes. Their label is taken as the labeling in Process Analyzer.
      - There is a reserved, special label ”Cost” that defines [Case] Cost.
  - Format (CSV, MS SQL)
    - Refer to Wiki http://devnet.qpr.com/pawiki/index.php/Workspace

© QPR Software

Load data (format and functional details)

- Event data
  - There must not be
    - Missing case ID for any line
    - Missing timestamp for any line
  - If you load events in several batches, these are *always appended* to data
    - You don't have to prepare and load all data at once, but you can load it in several batches
    - You cannot add new *event attributes* for existing events nor overwrite existing ones
  - You cannot remove events from the model
    - Tip: If you make a mistake, and don't want to start a new model from scratch – load only the erroneous event type again on a new name and exclude the invalid event type in analysis
- Case data
  - There must not be
    - Duplicate case IDs in the same file
    - Missing case ID for any line
  - There may be case IDs for which there are no Events in the model. These are stored, but not used in analysis.
  - Loading additional case data
    - **Case attributes are recognized by their labels**: they may appear in whatever order but remember that the first column is always the case ID, no matter what its label is.
    - For existing case IDs and attributes: if you load the same case IDs again, the data is overwritten
    - If there are new case attributes, these are appended
    - You can add new case attributes to existing cases and overwrite existing values
  - You cannot remove a case attribute from the model

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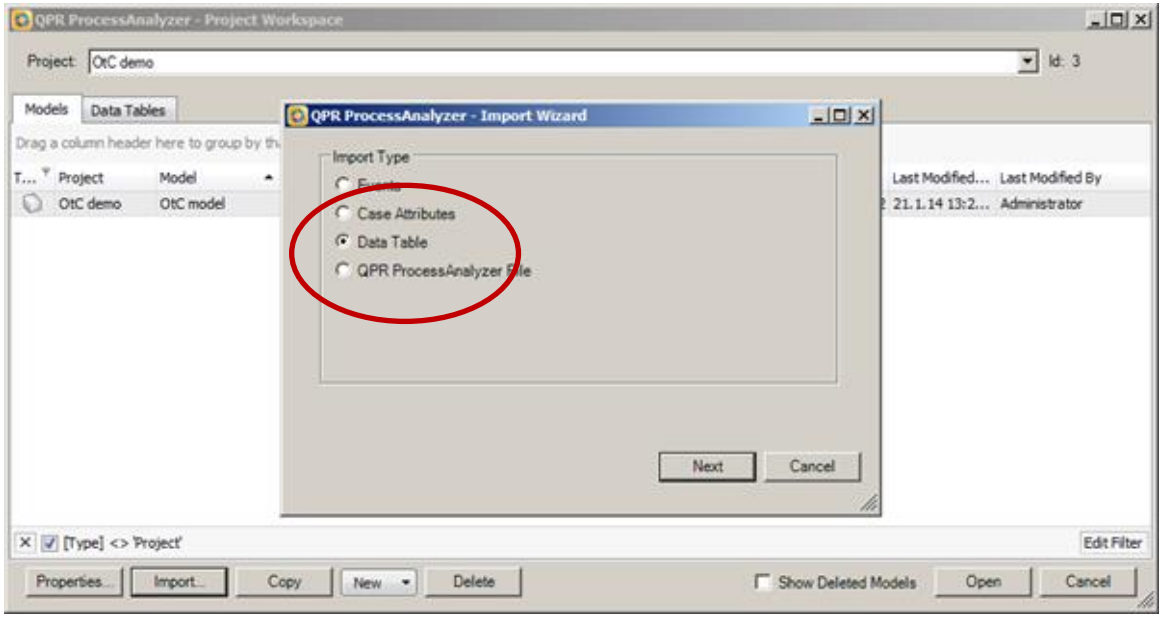
Data Table Import

- Data Tables are user-defined tables tied to projects in QPR ProcessAnalyzer Service
- You need Administrator rights to the project to import them
- Imported tables can be used in scripts



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More advanced: SQL and CSV

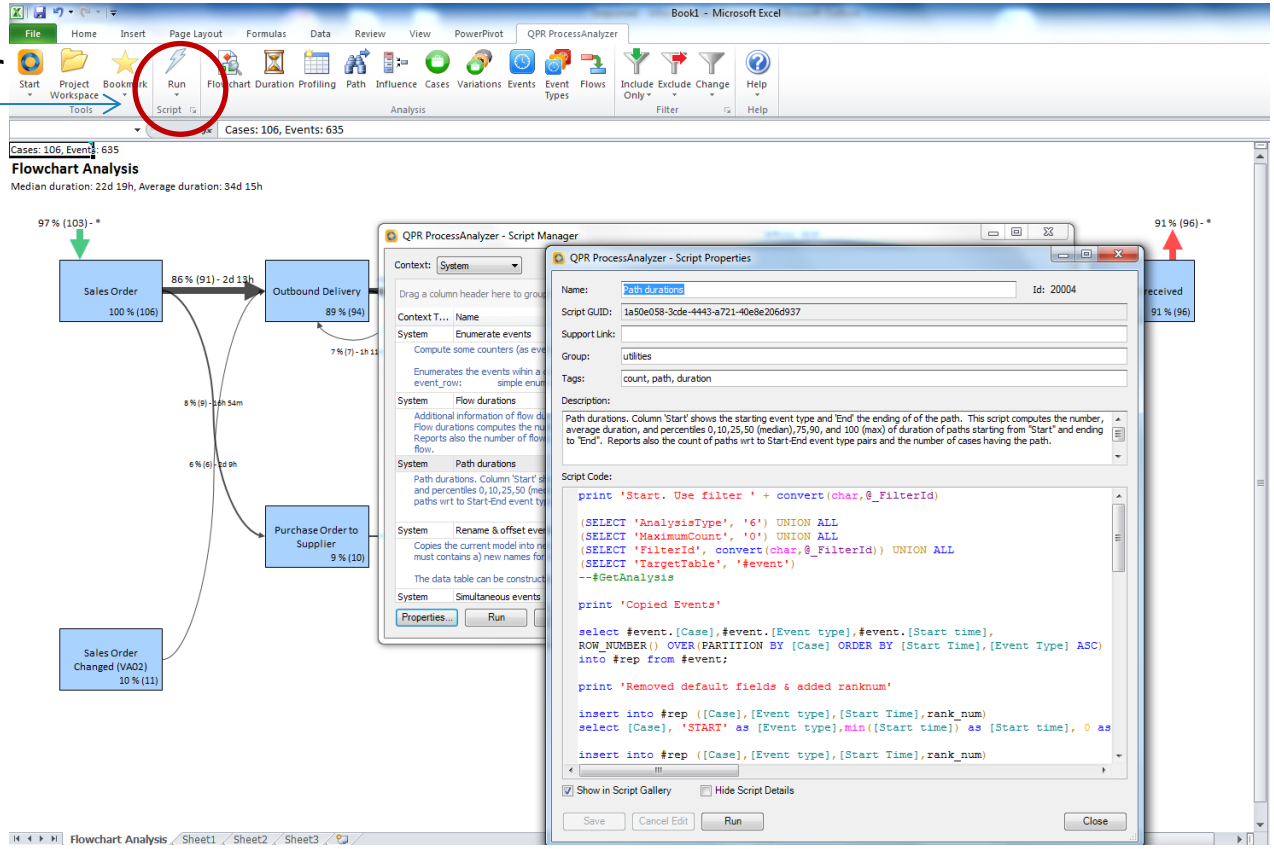
- Direct import from CSV files or MS SQL database
  - If data is readily in MS SQL database / CSV, one will skip the redundant step of importing it to Excel and again to ProcessAnalyzer
  - Especially useful with large amounts of data (no Excel restrictions)
- See Wiki for instructions

© QPR Software

Manage scripts

- Scripts allow user to develop ETL scripts in their own context and share the ready-made scripts inside a project

1. Access Script Manager from the Script tab



For more information on ETL scripts, see Wiki

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Discovery

Flowchart
Path Analysis
Selecting, Filtering

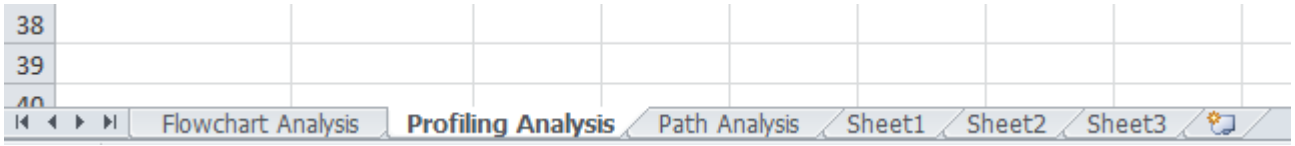
Analysis Tools used & Excel sheets

- In this section, we use three Analysis tools (Flowchart, Profiling, and Path) from the Tools ribbon
- Whenever you start an analysis, the result will appear on a specific Excel sheet
- When you re-run the analysis, the corresponding sheet gets overwritten
- Tip: If you wish to save an analysis result, rename the sheet on a non-reserved name.

Management

Analysis tools

Filter
Browse
Navigate



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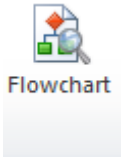
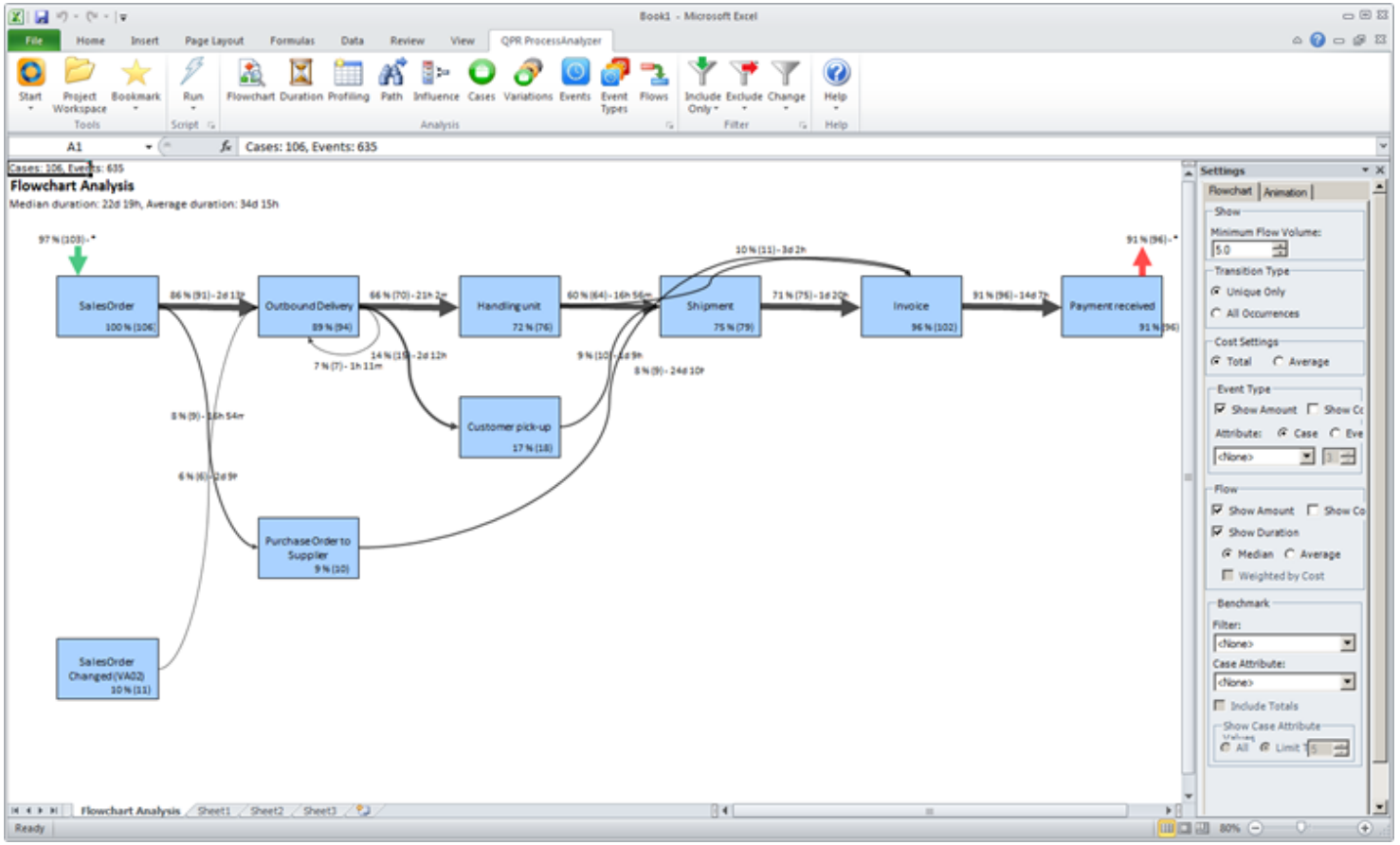
Flowchart view

You can re-run Flowchart Analysis by clicking 



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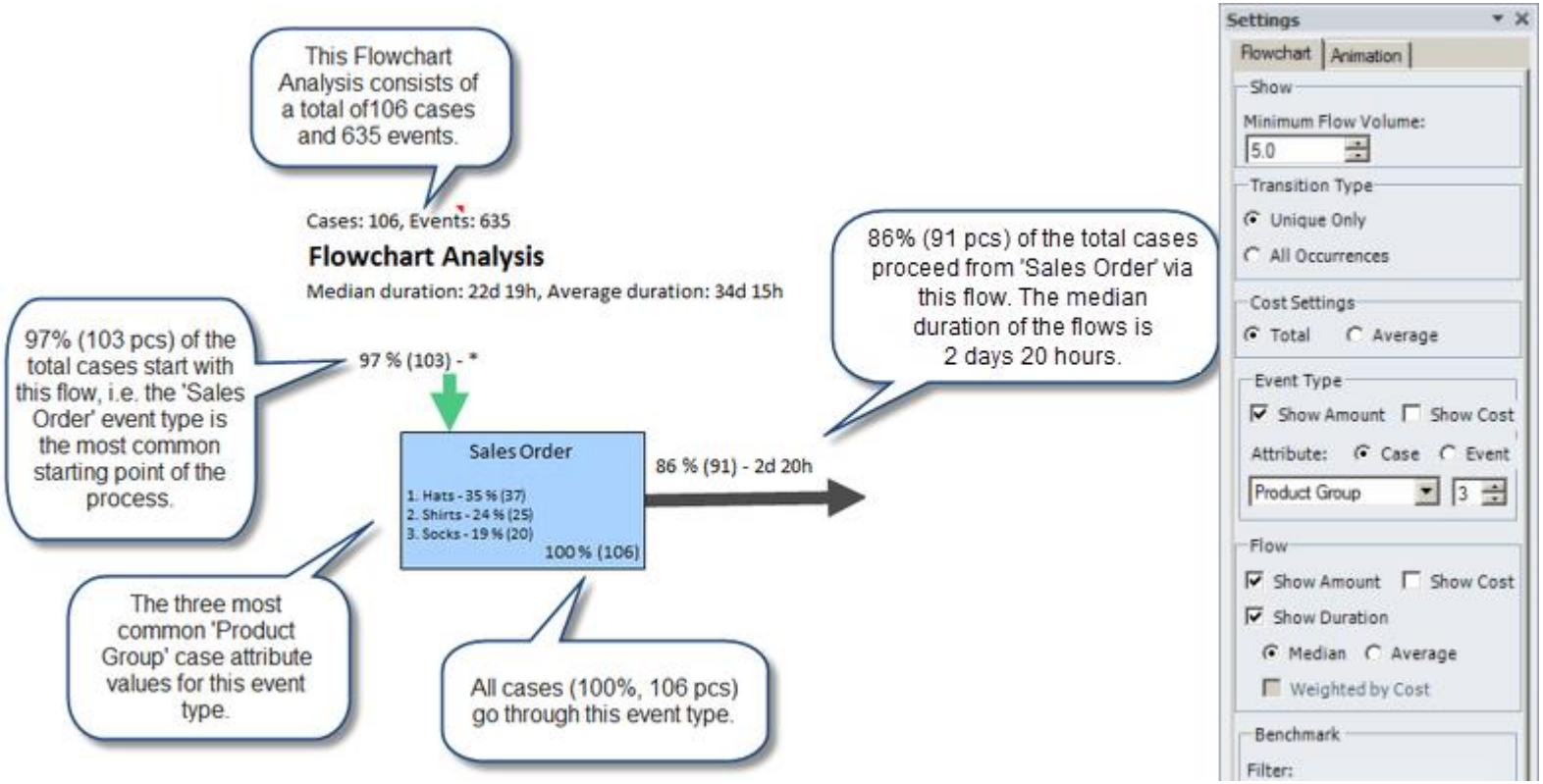
Basic concepts

- Flowchart view elements



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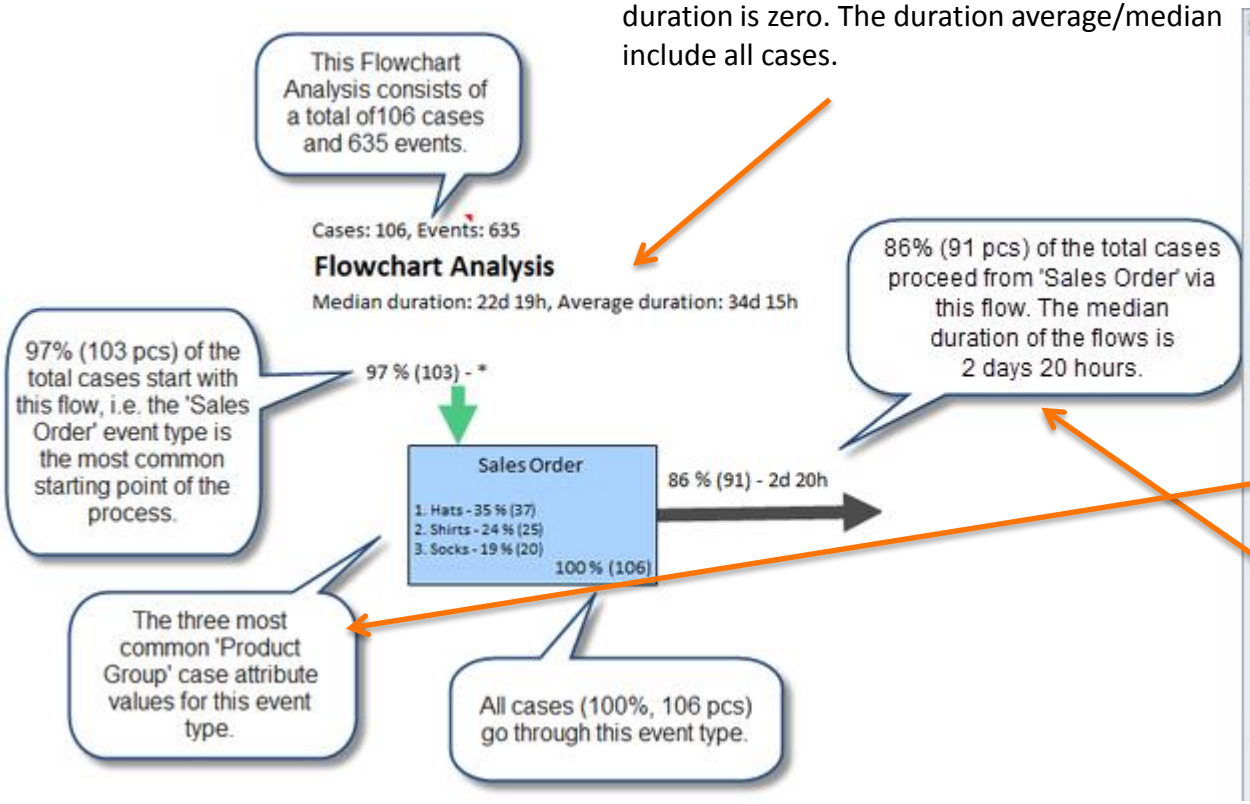
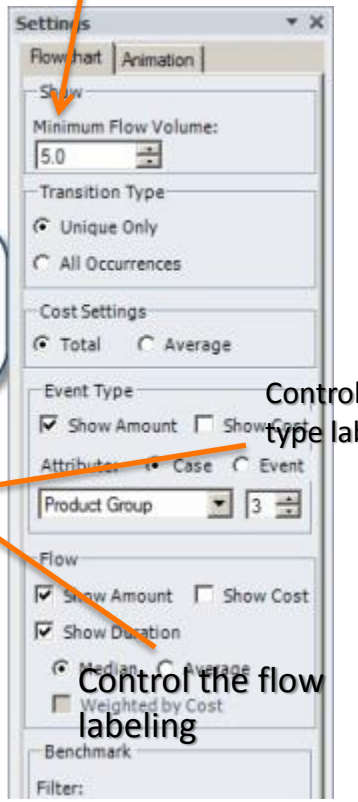
Basic concepts

Don’t show flows that involve less than 5% of cases

Duration from start-to-end. Note: the duration is measured. If there is only one event, the duration is zero. The duration average/median include all cases.





Control event type labeling

Control the flow labeling

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Example

- Show the data – event ID etc.
  - Look at the high level ’as-is’ image which is simple
  - Lower the flow volume from 5.0 to 0.0 and see how “the spider web” appears and the reality is not as simple as one expects it to be
  - Example of **conformance mapping**:
    - The organizations/process owners/analysts can see if the created process model matches reality
    - Add also the Cost/ Case attribute information to the event type

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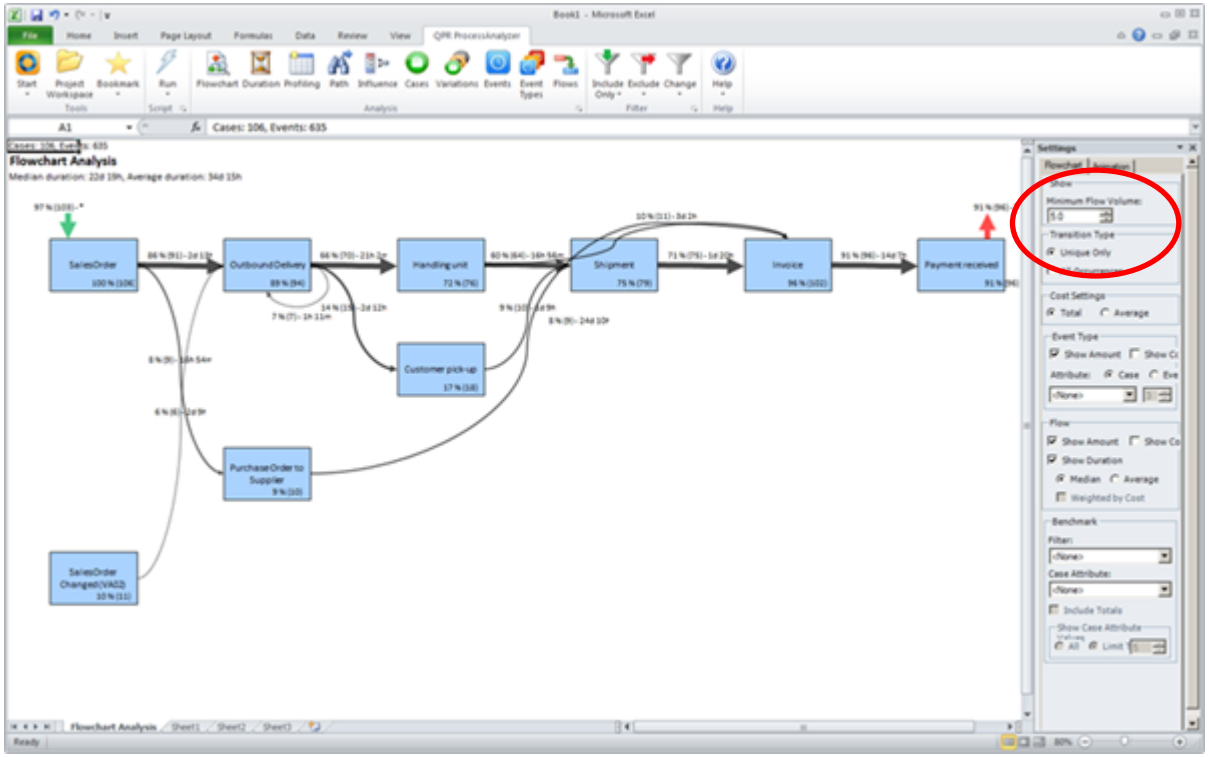

1. ’as-is’ situation

Here is the current process. It looks fairly clean and functioning.
Note that the minimum flow volume is at 5 – change it to 0.

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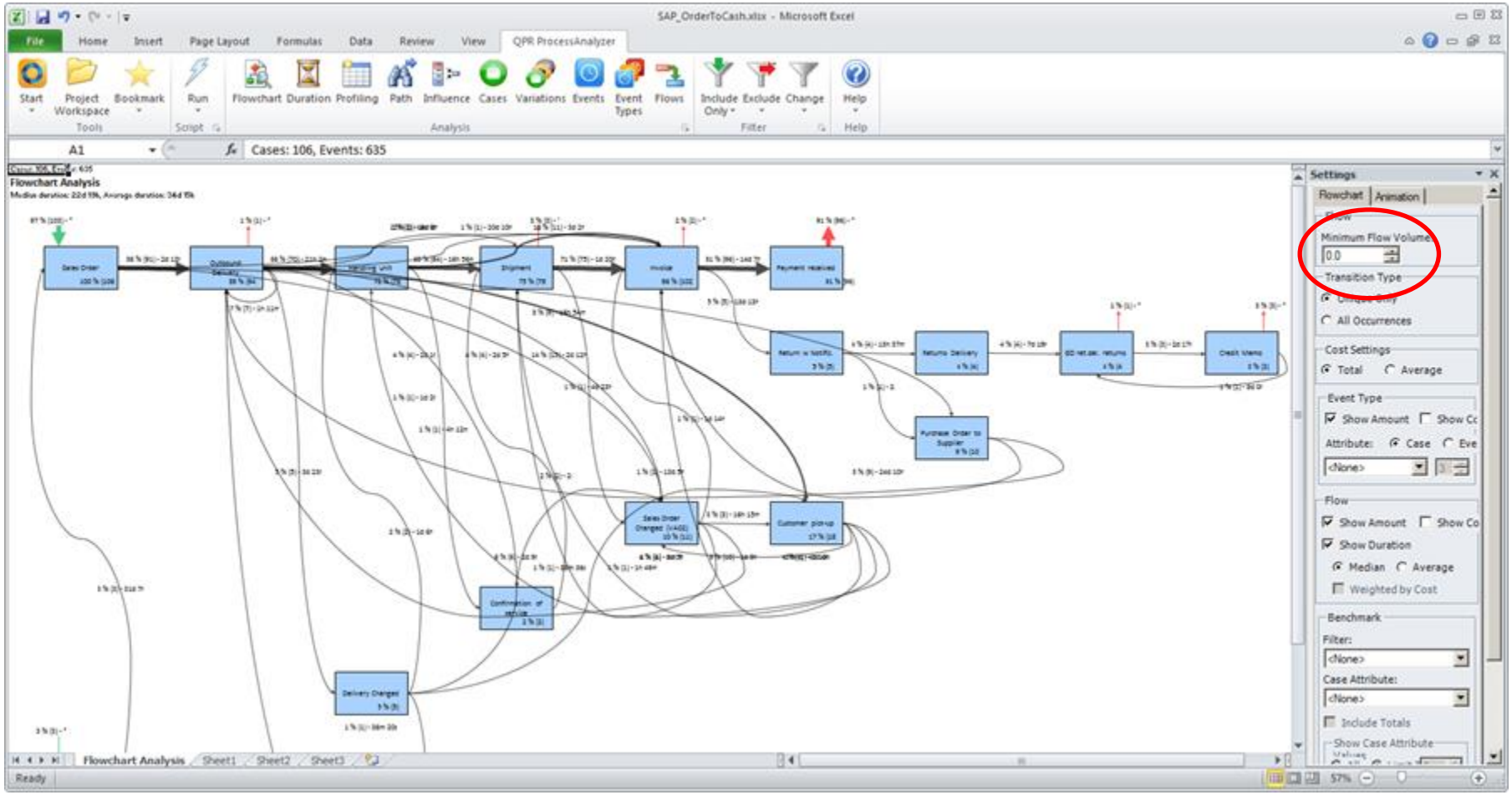

2. The spider web ’as-is’

With 0 as the Flow Volume, the real status of the process flow is clearly shown with all its deviations.

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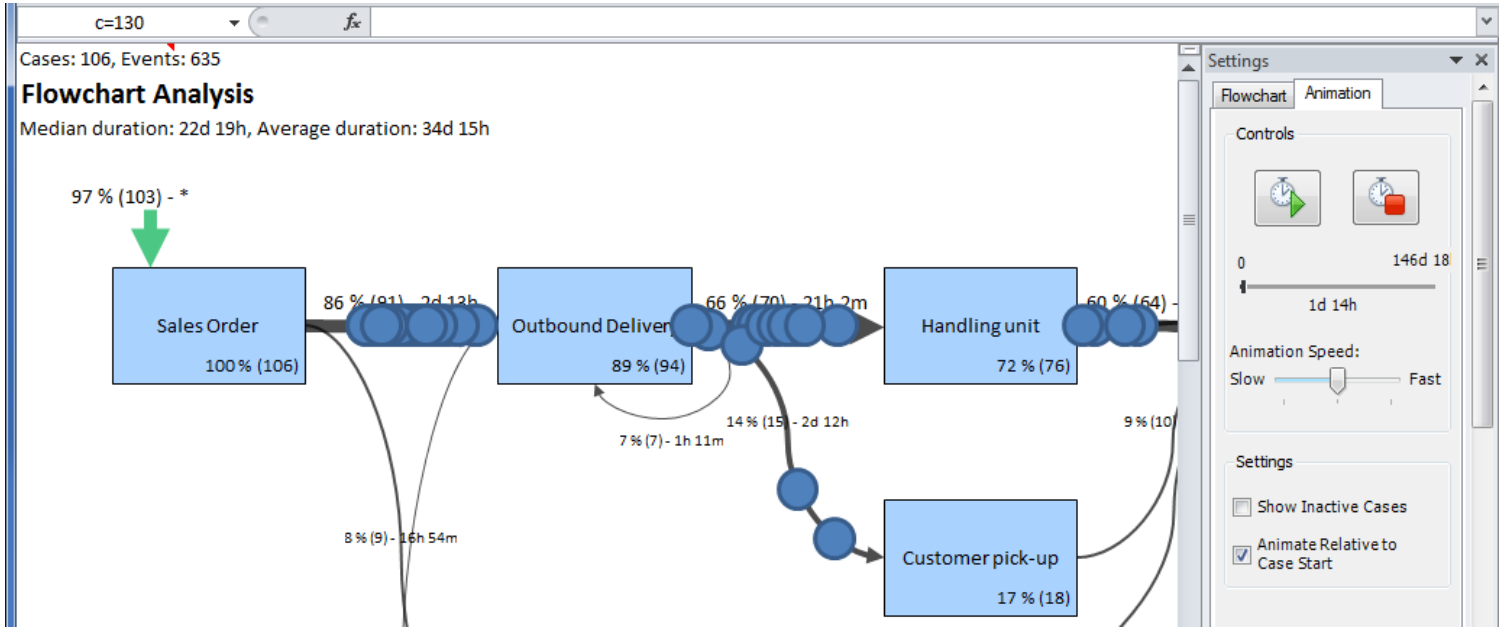
Flowchart animation

- Shows the execution of cases according to their sequence and timestamp durations
- Helps in visualizing bottlenecks and problems in the process



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Drilling-down and analyzing

- From most analysis views you can select
  1. graphical objects (event type boxes, flow arrows, and/or start/termination arrows)
  2. cells from tables
- After selection, you can start any other analysis tool from the ribbon
  - The analysis is now performed once on the subset of data that you just selected
  - In order to continuously use a specific subset of data for analysis, you use Filters: Include and Exclude
- Tip: In addition to selecting the objects from the Flowchart view you can for example
  - Select specific variations in the Variations view
    - select Influence to know the characteristic attributes for these variations
    - select Duration to see the cycle time of the variation
  - Select a certain path in the Path view and check all cases (Case Analysis) or that go through this path
    - Example: see from which sub-variations (possibly labeled using event attributes) one arrives to a certain event type

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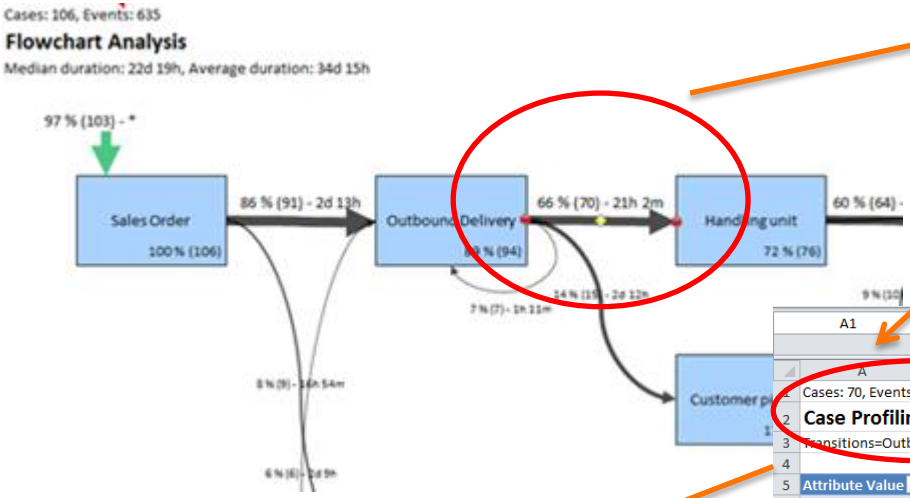
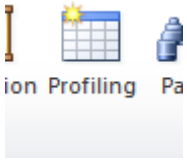
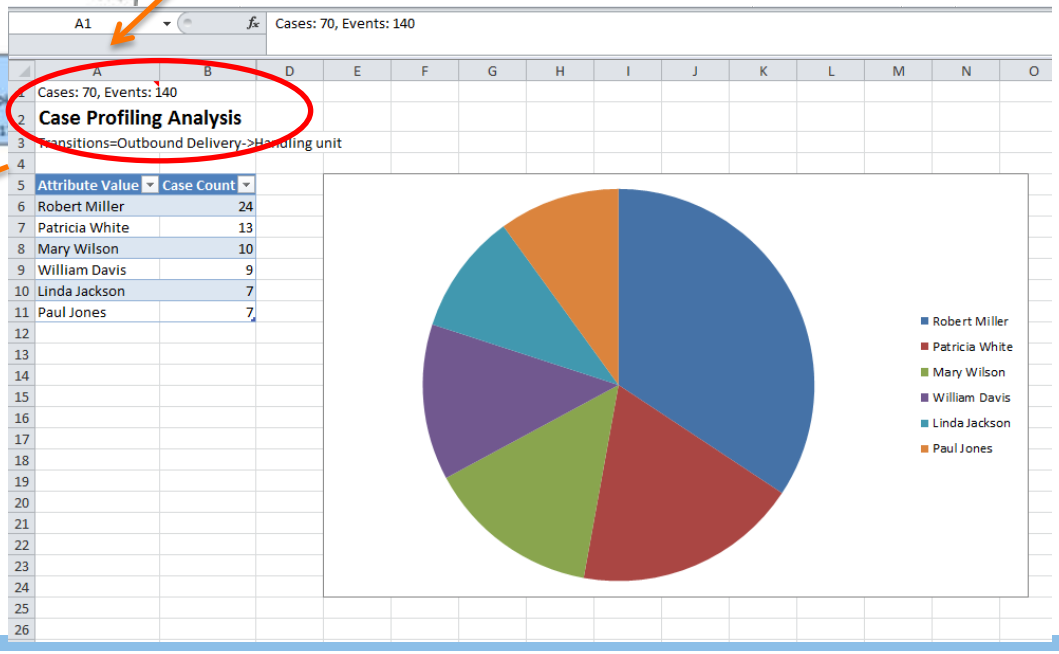
Select & Analyze

1. Select an object





2. Select an analysis



3. The selection to which the analysis applies is shown

4. Next time you open the Flowchart, the selection is reset

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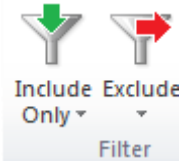
Filtering



- A persistent selection can be made by filtering
  - Cases
  - Event types
- Filtering allows
  - **Concentrating on relevant parts of the process in the context of the analysis task**. Examples:
    - analyze only *Los Angeles* (include only the cases with the case attribute *region=Los Angeles* in the Profiling view)
    - analyze only the cases not yet invoiced (exclude cases that contain event ”Invoiced” in Event Type table or Flowchart...)
    - analyze the full lead time between Sales order and Picking request (exclude other event types)
  - **Cleansing erroneous or exceptional behavior**

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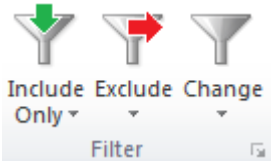
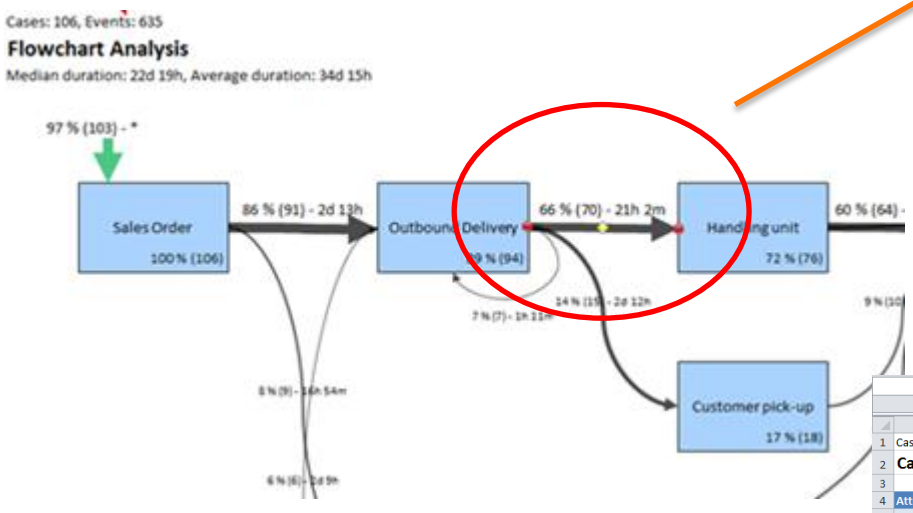
Filter & Analyze

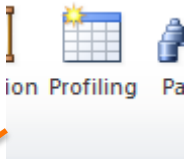
2. Filter (include only cases)

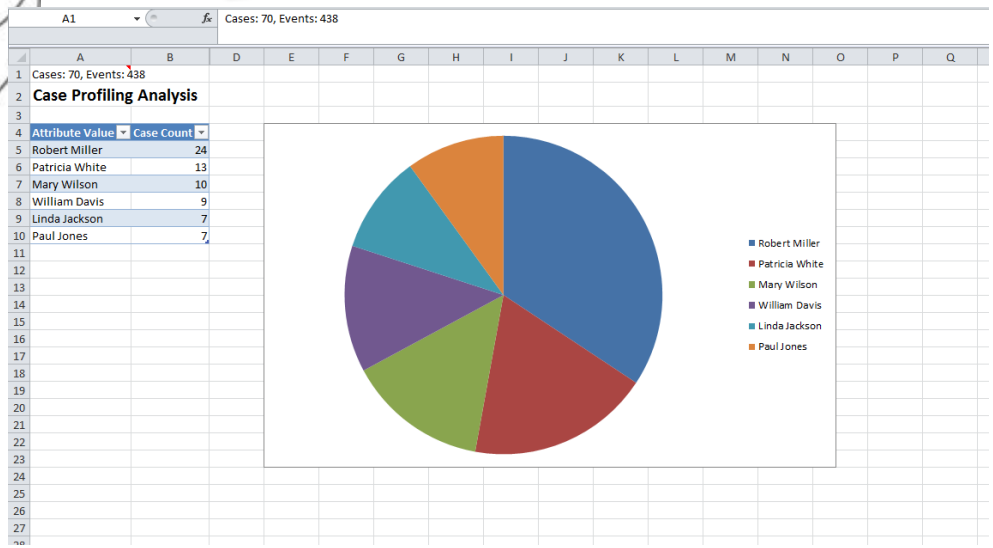


1. Select an object



3. Select an analysis





4. Next time you open the Flowchart, the filter persists

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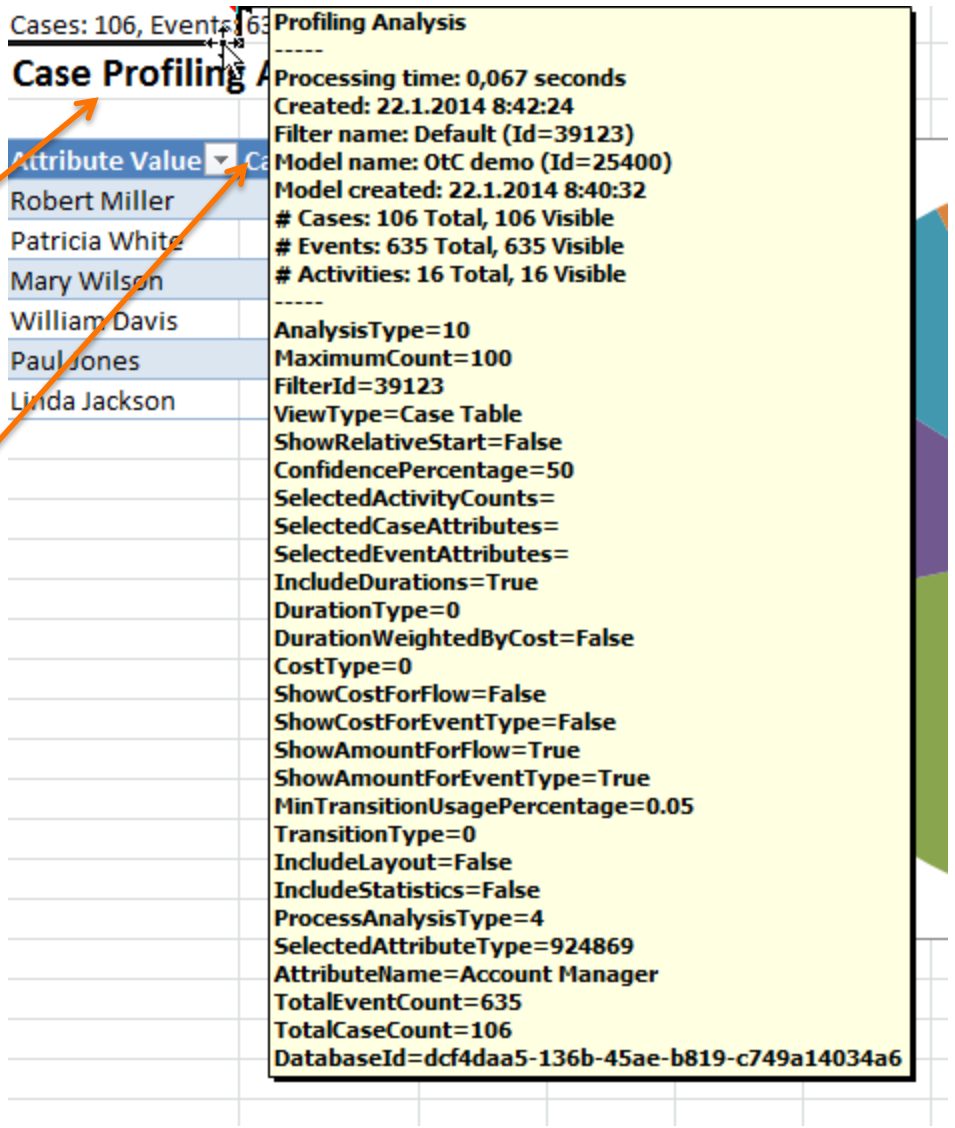
Filtering

- Note that there is now no selection label
  - *Cell A1* shows that there is a filter
  - Filter appears to Filter stack
- We'll come back to this later on



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Filters (details)

- Filters can be created almost from any selection made in any analysis view selection
  - A restriction: you cannot select specific *Events* to be filtered (only event types)
- Filters are applied ”on top of each other”
  - i.e. you narrow your event type / case set as you proceed
  - Filters are collected into a stack, and you can recall an earlier filter whenever you wish
- You can specifically remove the previously made case, event type, or variation filter from the current filtered view
- When including cases by selecting several Event Types, QPR ProcessAnalyzer uses AND operation: you pick cases that include all of the selected events

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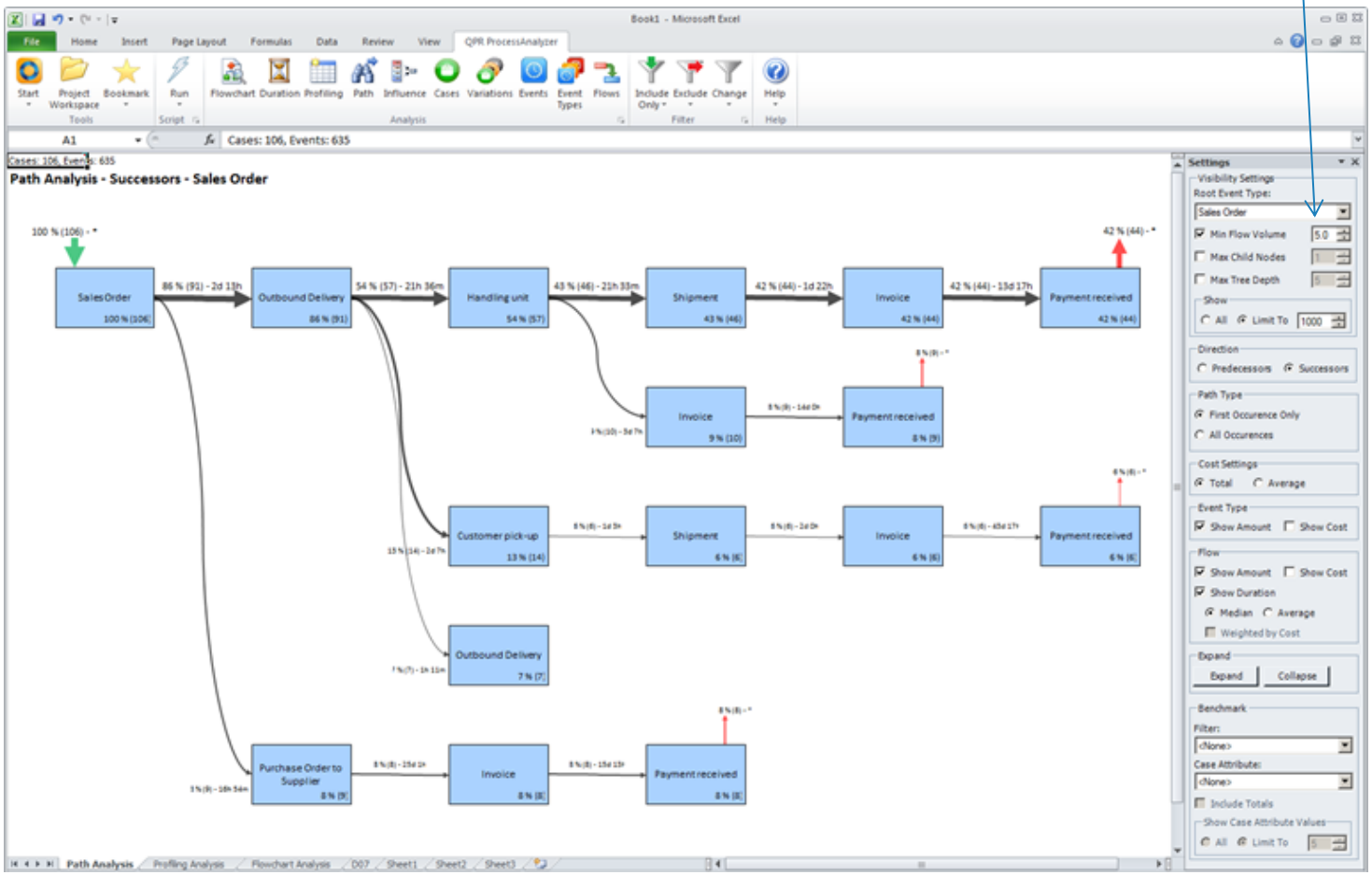
Path view

- Another ”helicopter view” for variation oriented view

Flow volume



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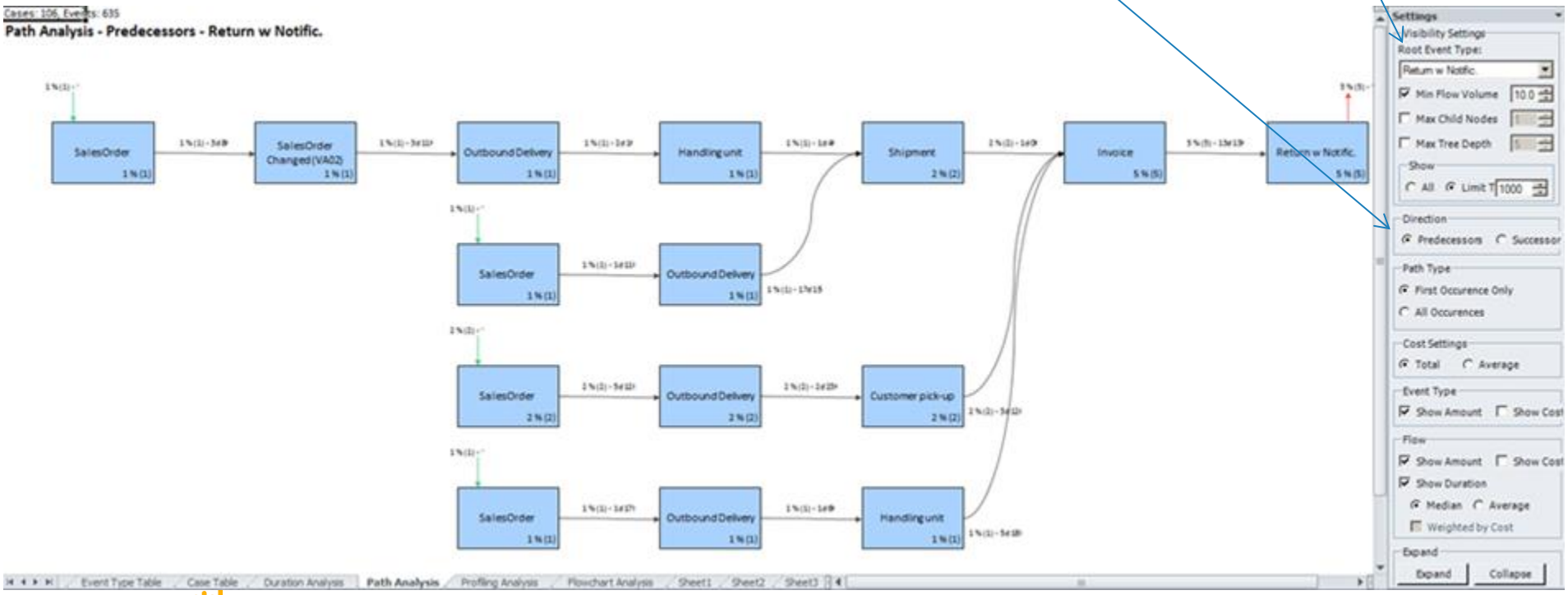
Successor / predecessor paths

- You can trace how the process ends up in a certain state

Root node (one or all)

Note that you can see paths to an event type



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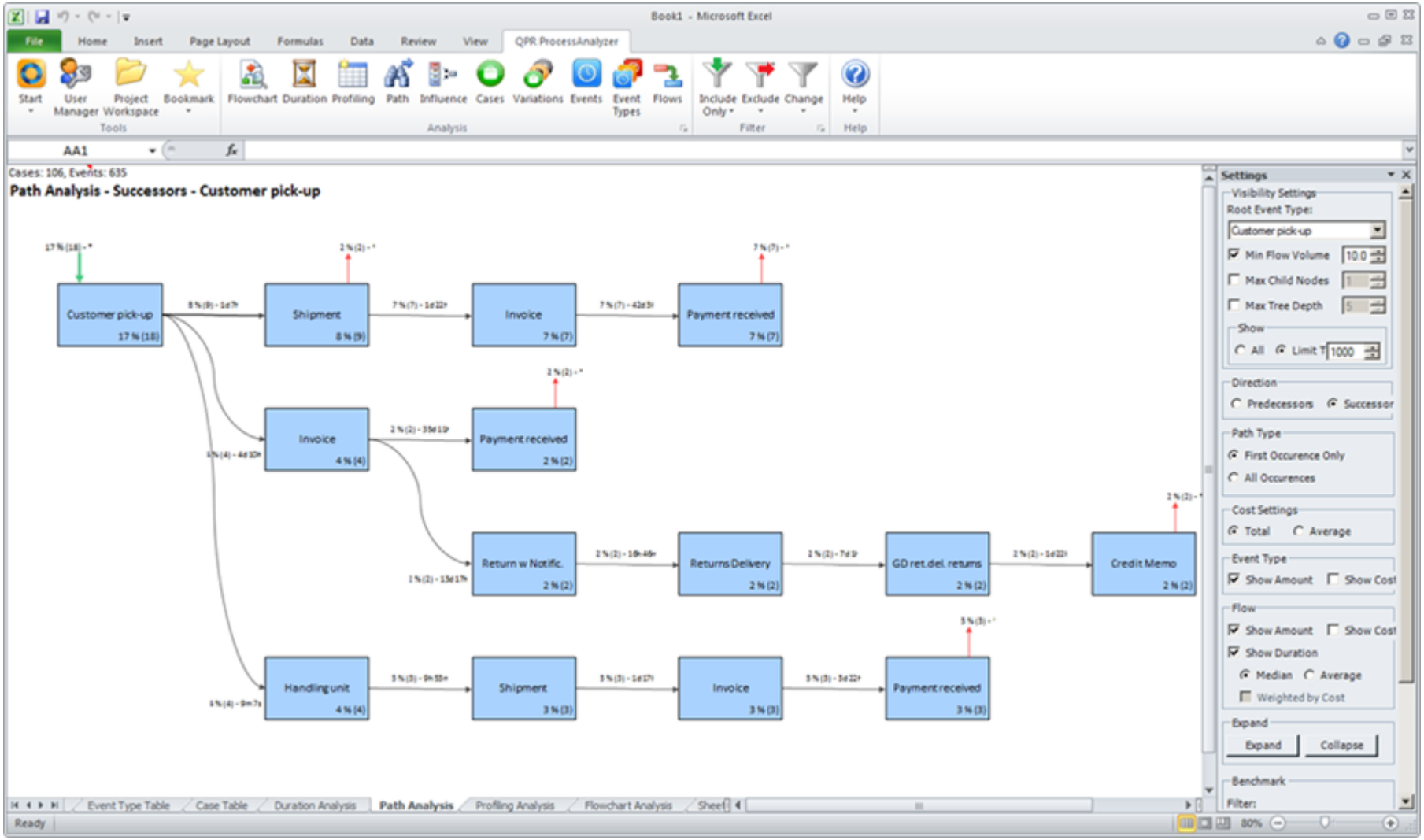

Path

Look at the variation and see what process steps usually follow or lead to the variation.

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Flowchart vs. Path view

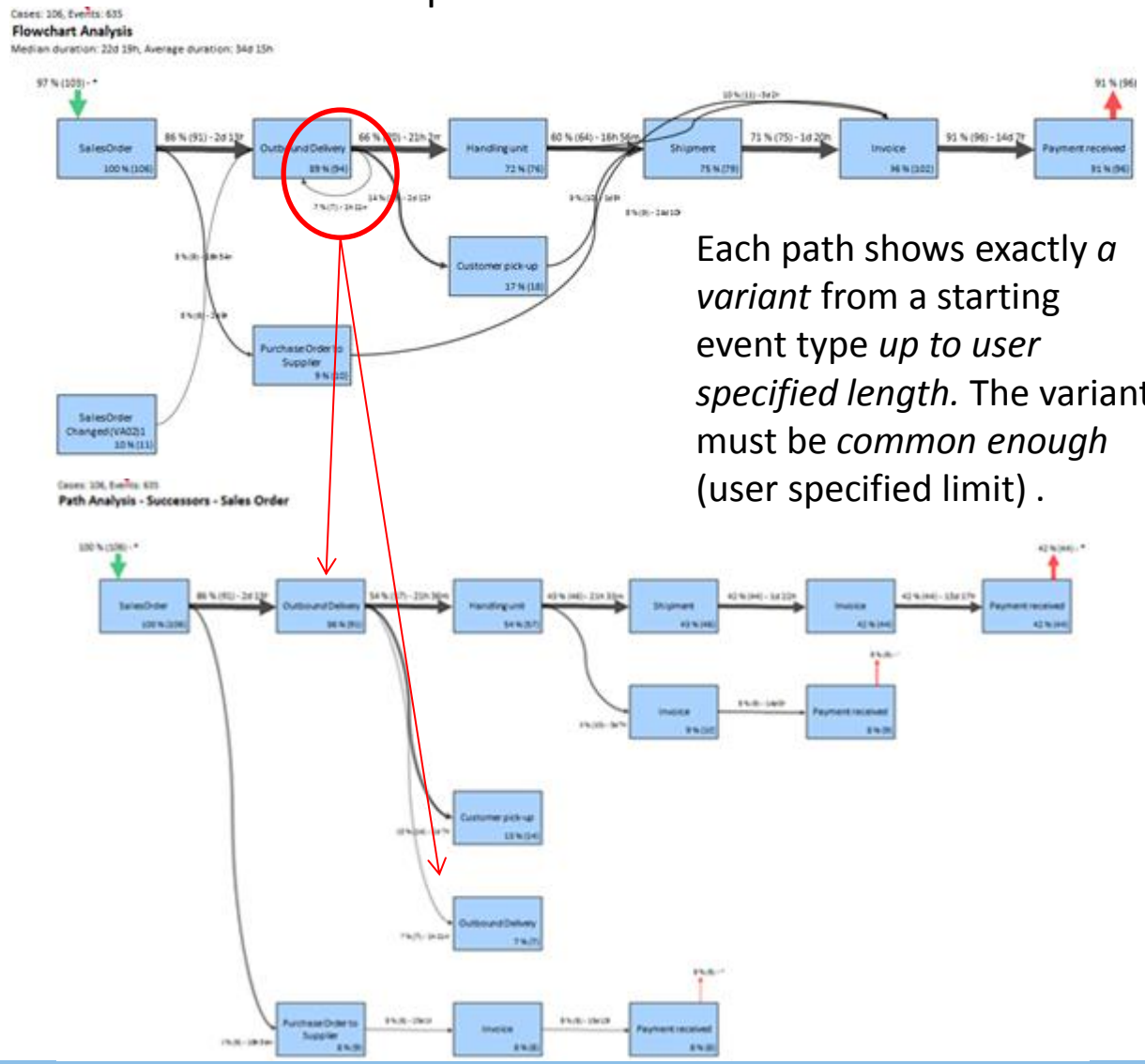
Loops and recursions are easily spotted on Flowchart but ”opened” in Path view

Flowchart view

- Ideal for overview
- Capable of compactly showing all transitions and event types
- Each event type and transition type shown only once
- Based on the same transition table as ”Flows”

Path view

- Ideal for getting precise understanding of process variations in a structured manner
- Capable of showing all variants unambiguously
- Event and transition types reappear
- Based on tree structure either from or to some event type



Each path shows exactly *a variant* from a starting event type *up to user specified length.* The variant must be *common enough* (user specified limit) .

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Example

The scene

- Step 3. **How big percentage of orders is invoiced?**
  - Find out what percentage of orders are not invoiced.
  - Find out what happens in the process linked with the value of the missing invoices.

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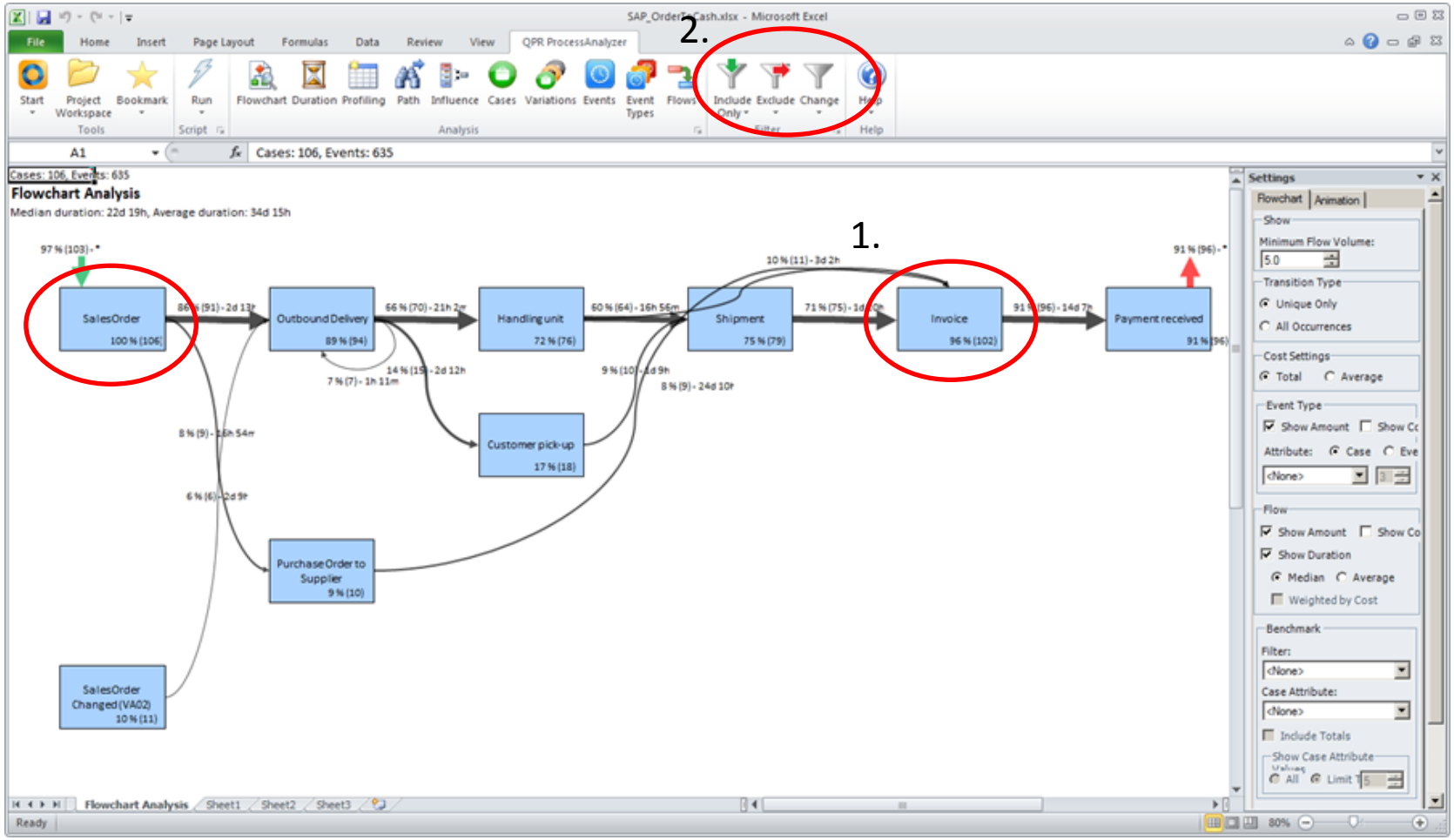

Not all orders invoiced

From the Flowchart Analysis, you can directly see that from Sales Order, 96% are invoiced. What happens to the 4% which are not invoiced? This needs further investigation:

1. Choose Invoice Event Type
2. Click on Exclude

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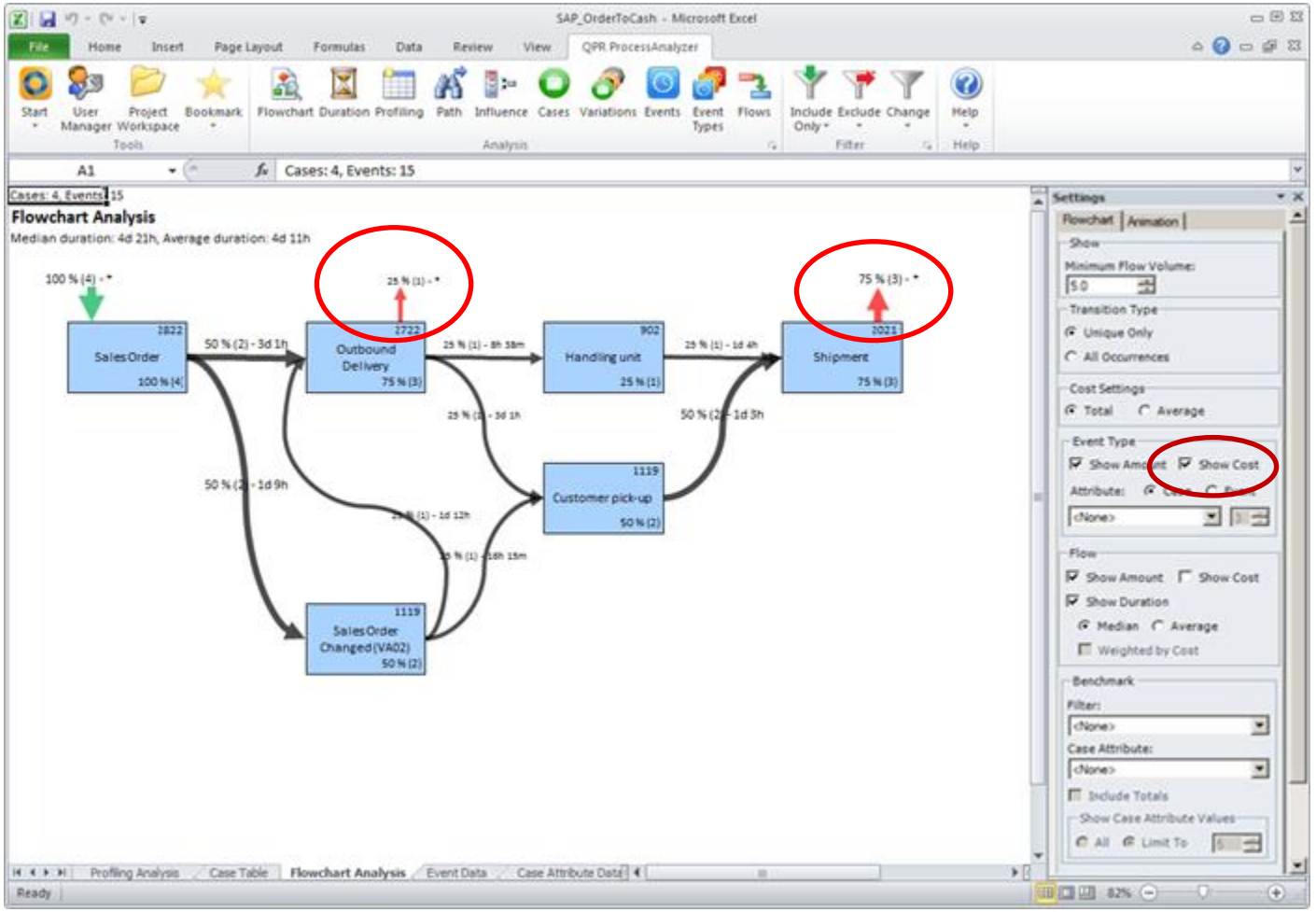


Not all orders invoiced

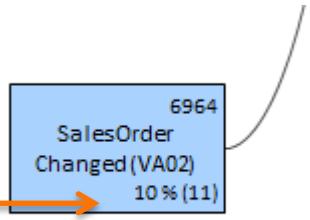
You can see how the process goes for the orders that are not invoiced and also the monetary value that is lost. One case is lost in Outbound Delivery and three shipped out without invoices.

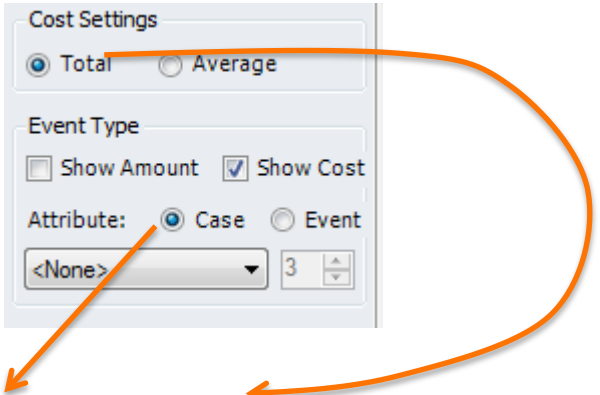
© QPR Software

Case Cost

- Case cost is imported to the model in Case attribute data
- Use column name Cost
- The Flowchart / Path / Flows / Event Types views compute and show the sum cost of cases that include the specified event type
- (Event cost is imported in Event Attributes)

Eleven cases contain event type ”SalesOrder Changed (VA02)”





The **case** cost **sum** is 6964

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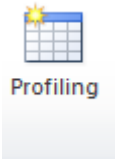
Analysis

Validation
Analysis functions

Profiling the data

Event types
Profiling

Profiling

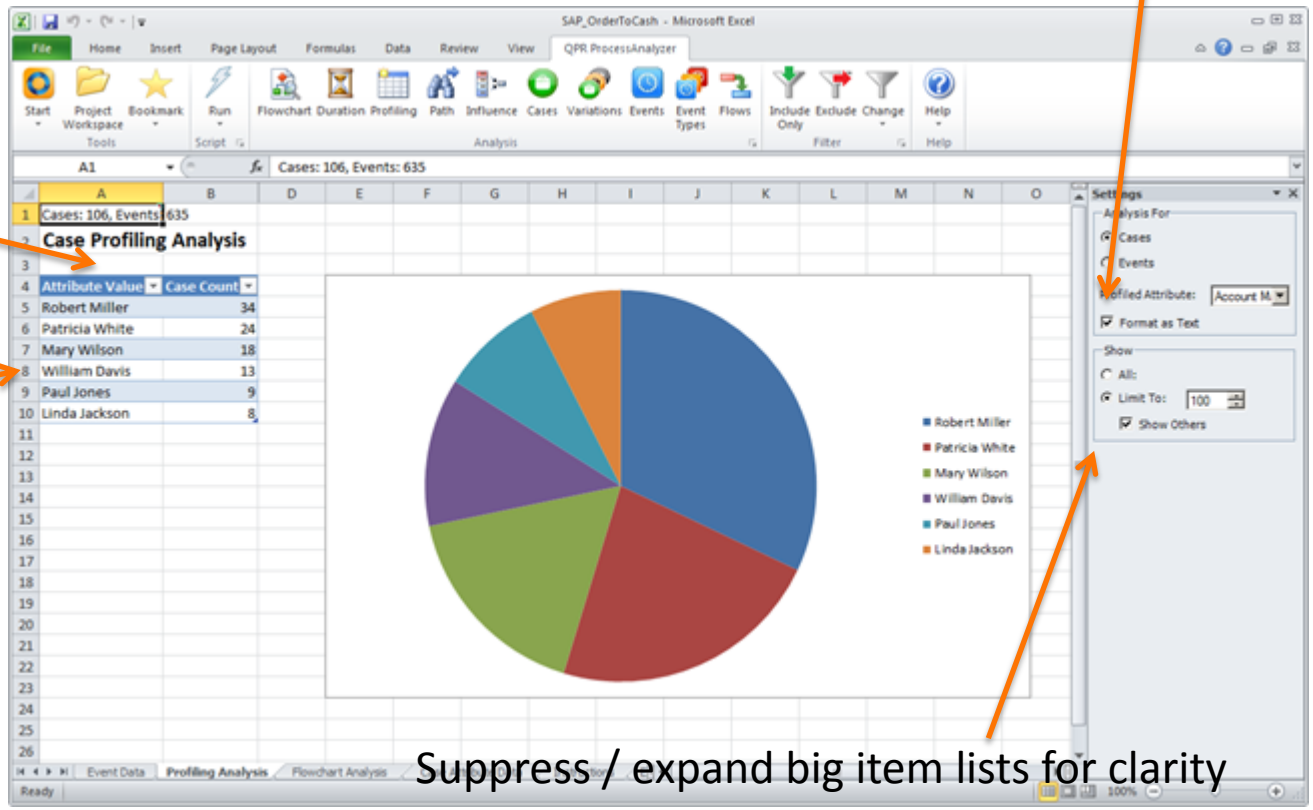


- Use for understanding or validating the data
- Making appropriate selections / filters
- Drill-down
- Statistics

Sort as text or numbers?

Sort / filter

Select for filtering or analysis focus



Suppress / expand big item lists for clarity

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Event type

Note: the default is to show 20 most common event types. Change to ”All” to see all event types.

Sum of Case Cost for unique cases that contain this event type

Number of Cases containing this event type

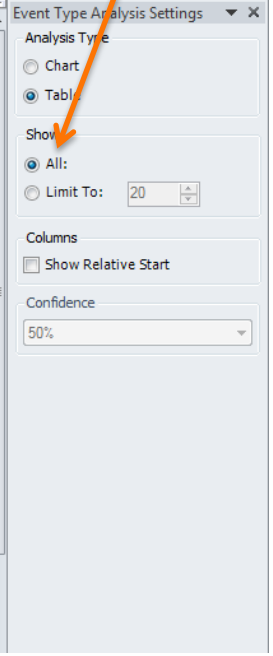
Number of events of this type (incl. repetitions)

Select for filtering or analysis focus

Cases: 106, Events: 635

Event Type Table

Name	Count	Unique Count	Event Cost	Unique Event Cost	Case Cost	Unique Case Cost
Outbound Delivery	107	94	0	0	68260	61885
Sales Order	106	106	0	0	68201	68201
Invoice	103	102	0	0	65455	65379
Payment received	96	96	0	0	56519	56519
Shipment	79	79	0	0	47586	47586
Handling unit	76	76	0	0	46012	46012
Customer pick-up	19	18	0	0	19015	18141
Sales Order Changed (VA02)	11	11	0	0	6964	6964
Purchase Order to Supplier	10	10	0	0	6414	6414
Delivery Changed	5	5	0	0	2711	2711
GD ret.del. returns	5	4	0	0	10194	7814
Return w Notific.	5	5	0	0	7890	7890
Credit Memo	4	3	0	0	9392	7012
Returns Delivery	4	4	0	0	7814	7814
Quotation	3	3	0	0	1004	1004
Confirmation of service	2	2	0	0	147	147



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Advanced notes

Attribute and process data validation

Attribute check

- Objective
  - avoid GIGO (garbage in – garbage out)
  - Ensure that you understand the meaning of case and event attributes
- Tools: QPR ProcessAnalyzer Profiling (+ SQL + other data tools)
- Questions
  - What does this attribute mean?
    - What is this variable type (nominal, float, number, time)
    - What are the codes that appear in the data
  - What is the distribution? Does it affect the analysis?
  - Some questions:
    - Is the distribution correct (or at least possible)
    - Are there *outliers (”too big”, ”too small”) or erroneous values?*
    - Are there missing values, is it ok?
    - Should zero, or some other values, be treated separately?

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Process sanity-check & initial analysis

- **Objective: Enable analytics: avoid GIGO, enrich the process model with relevant attributes / events**
  - Tools: QPR ProcessAnalyzer + Excel (+ SQL, other data tools)
- Often the data to ProcessAnalyzer is acquired through several steps and include lots of processing

- Event Types
  - Is the volume ok / Check frequency of events
  - Do you understand the meaning of the activities?
- Cases
  - Number of cases started / ended in the time frame
  - Look for gaps / spikes / trends
  - Check typical case length (cycle time) vs. the available data time window
- Process
  - Verify with a process expert
  - Is the ABPD visualization realistic at all?
  - Are the lead times realistic?
    - Check resolution (only date available vs. time)
    - Check zero lead time ordering inconsistencies
  - Are we missing something essential?
- Create features that are necessary for the analysis
  - Filter unnecessary events / cases
  - Cleanse or reshape data
  - Make more transformations (events / cases)
  - Reacquire data

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Benchmarking

Paths / Flowchart
Conformance

Benchmarking

- Going back to Flowchart, users are able to benchmark and compare processes based on system's users or case attributes
- In one view the users can see how the processes are performing depending on the comparison criteria

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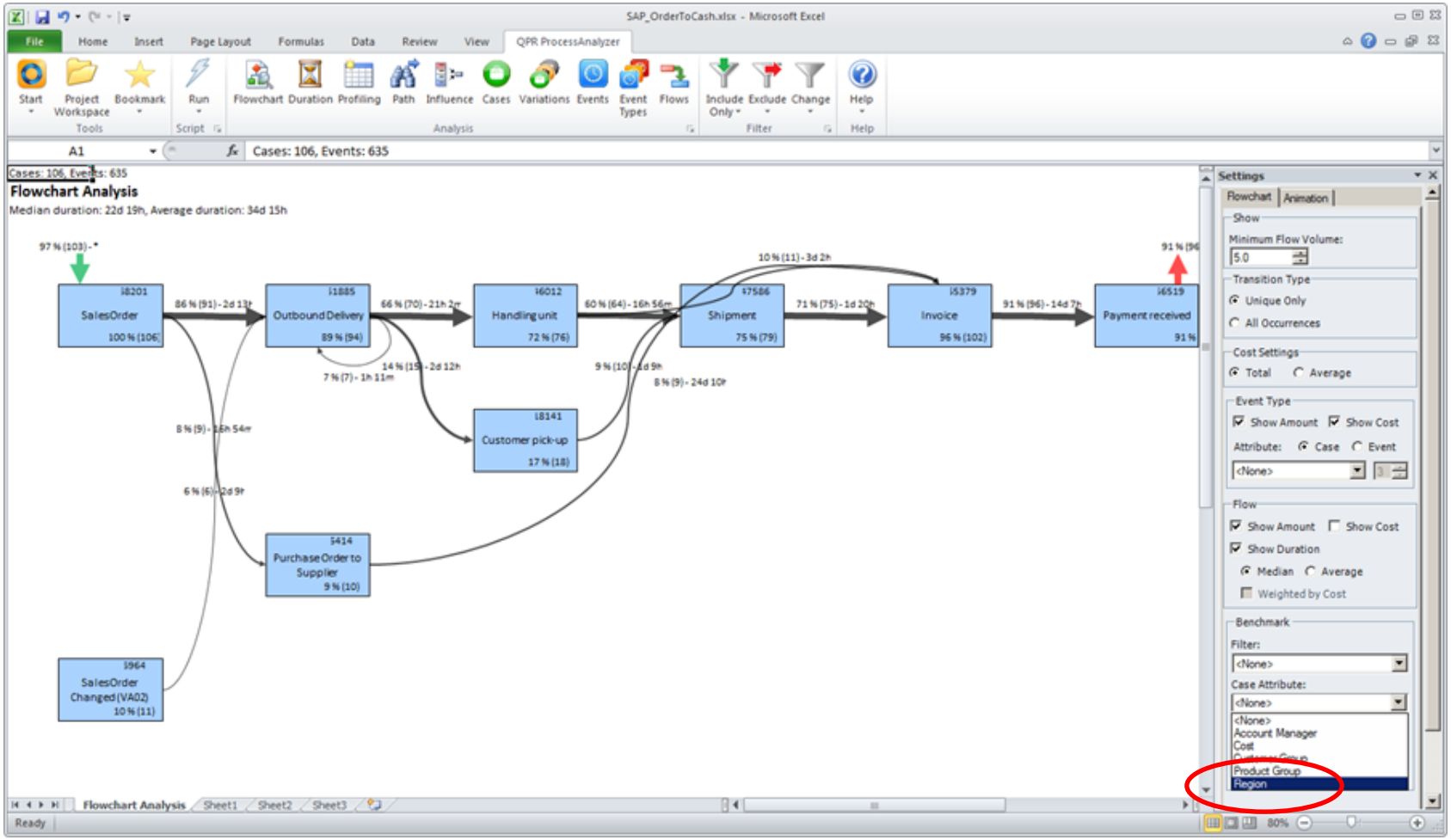

Bottleneck / Conformance discovery - Benchmark

From the Flowchart Analysis view, go to Benchmark section and select Region as the Case Attribute.

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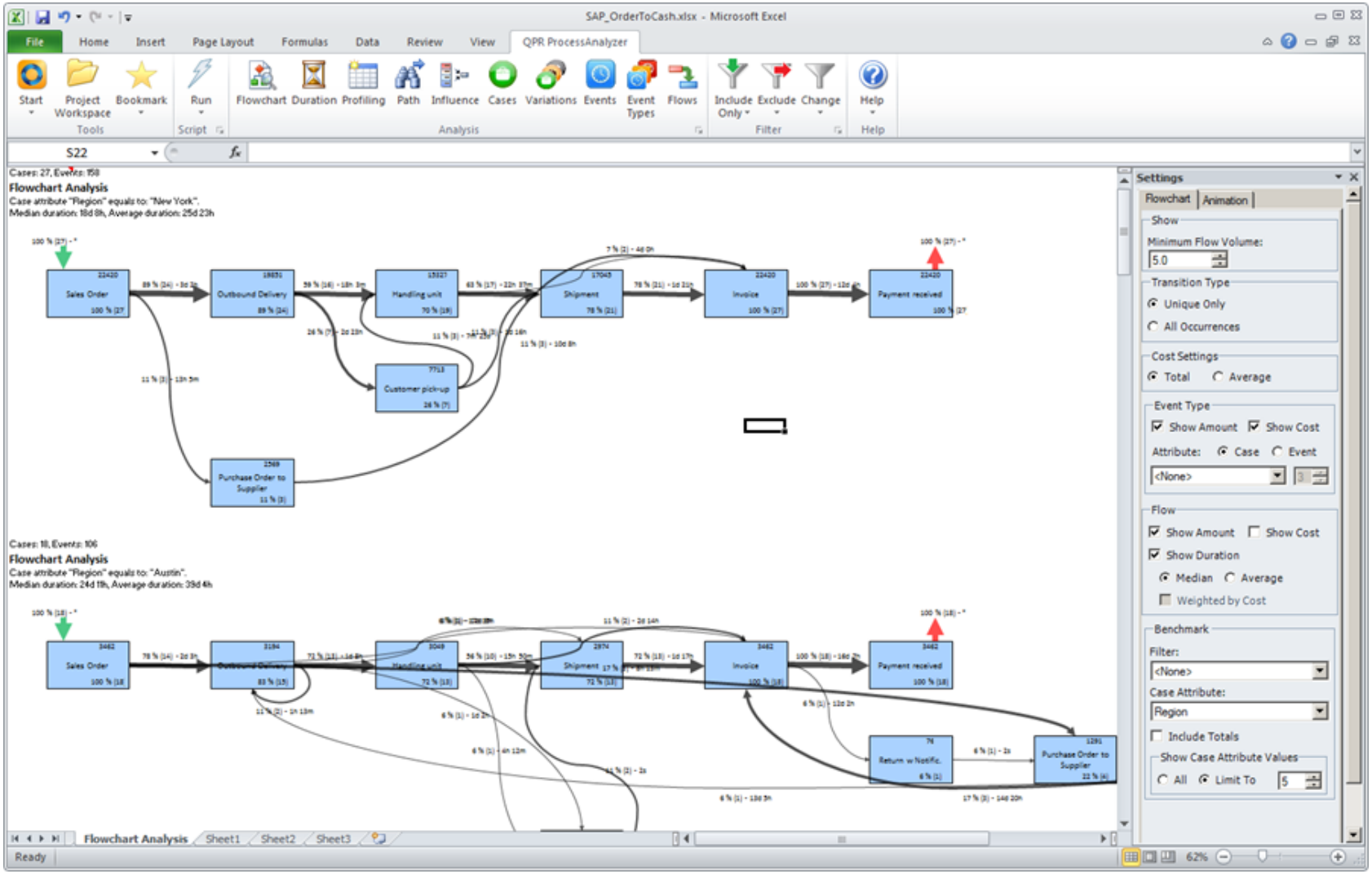

Bottleneck Discovery / Conformance - Benchmark

Now you can see the process per Region and compare the performance of those locations. It seems that New York and Austin are performing fairly well.

Scroll down to find Dallas.

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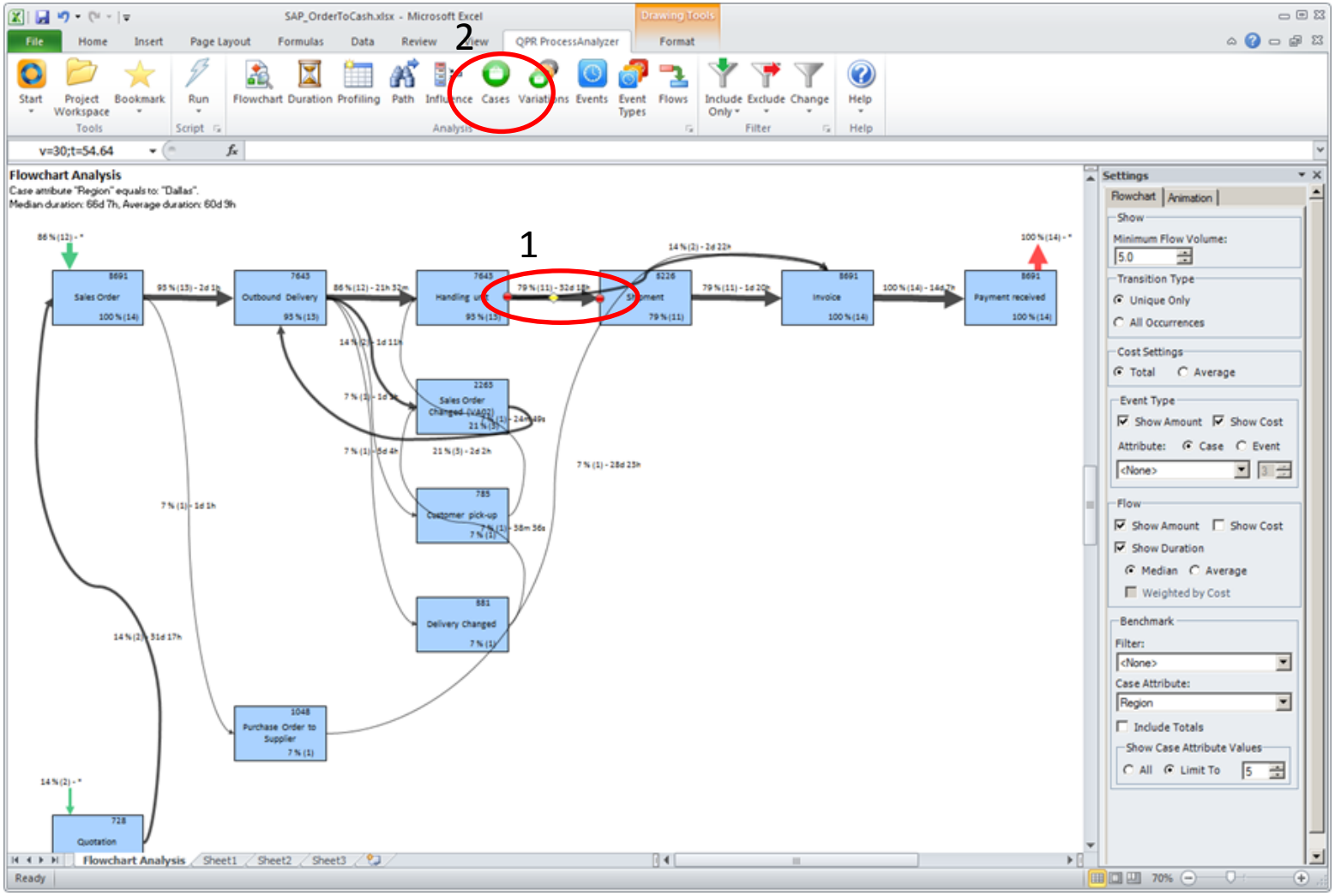
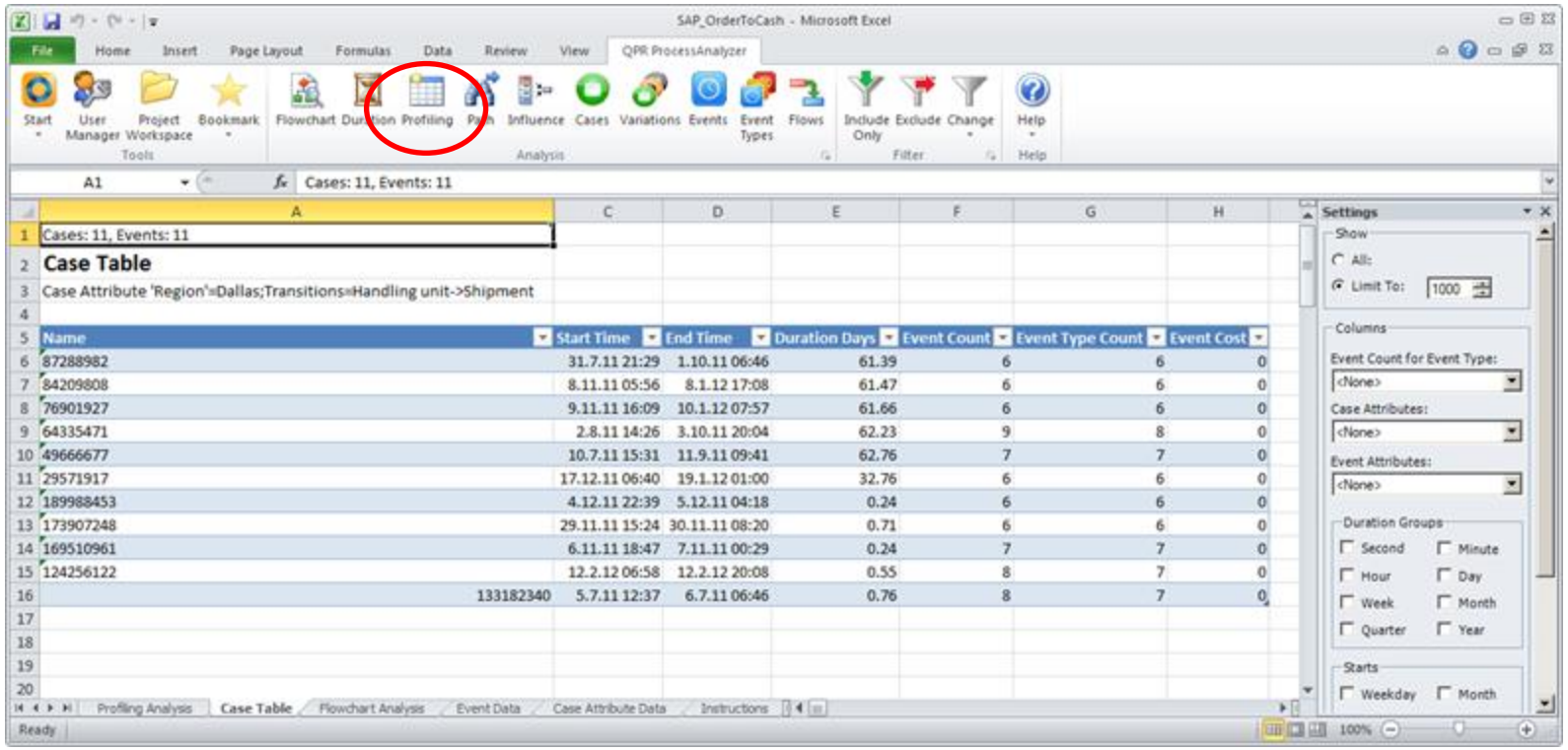


Bottleneck discovery - benchmark

Dallas: There we can see that time between Handling Unit and Shipment takes over 31 days.

Click on the arrow and then select the Cases tab.

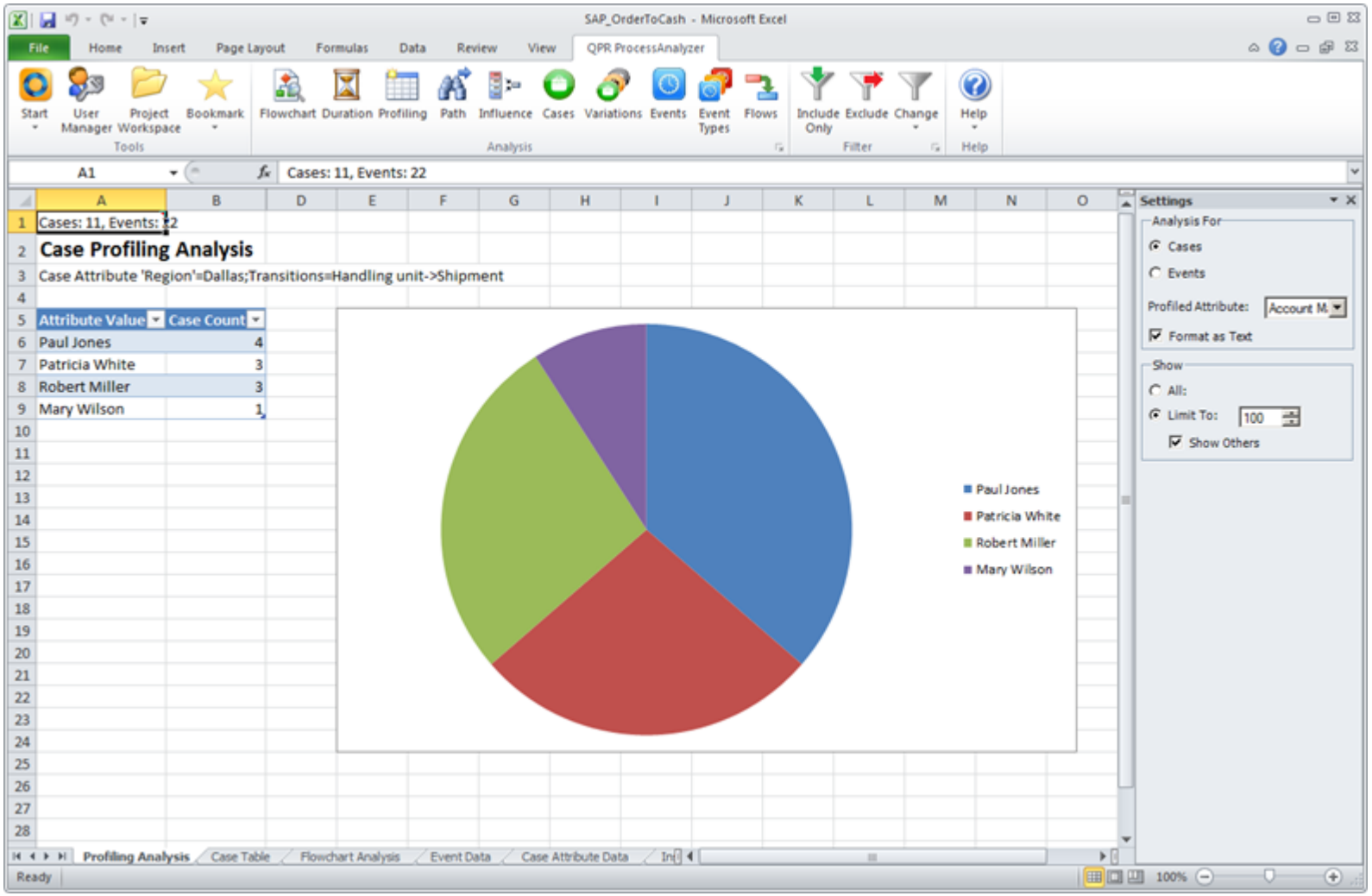
© QPR Software



Bottleneck discovery - benchmark

From the Cases tab, identify the specific cases which allow you to discover what attributes are behind these cases and finally the root cause. Select the Profiling tab.

© QPR Software



Bottleneck discovery - benchmark

With Profiling Analysis, you can see e.g. which account managers have been responsible for the cases, allowing you to get to the root cause of the delayed deliveries.

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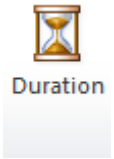
Duration

Performance and bottlenecks

Duration



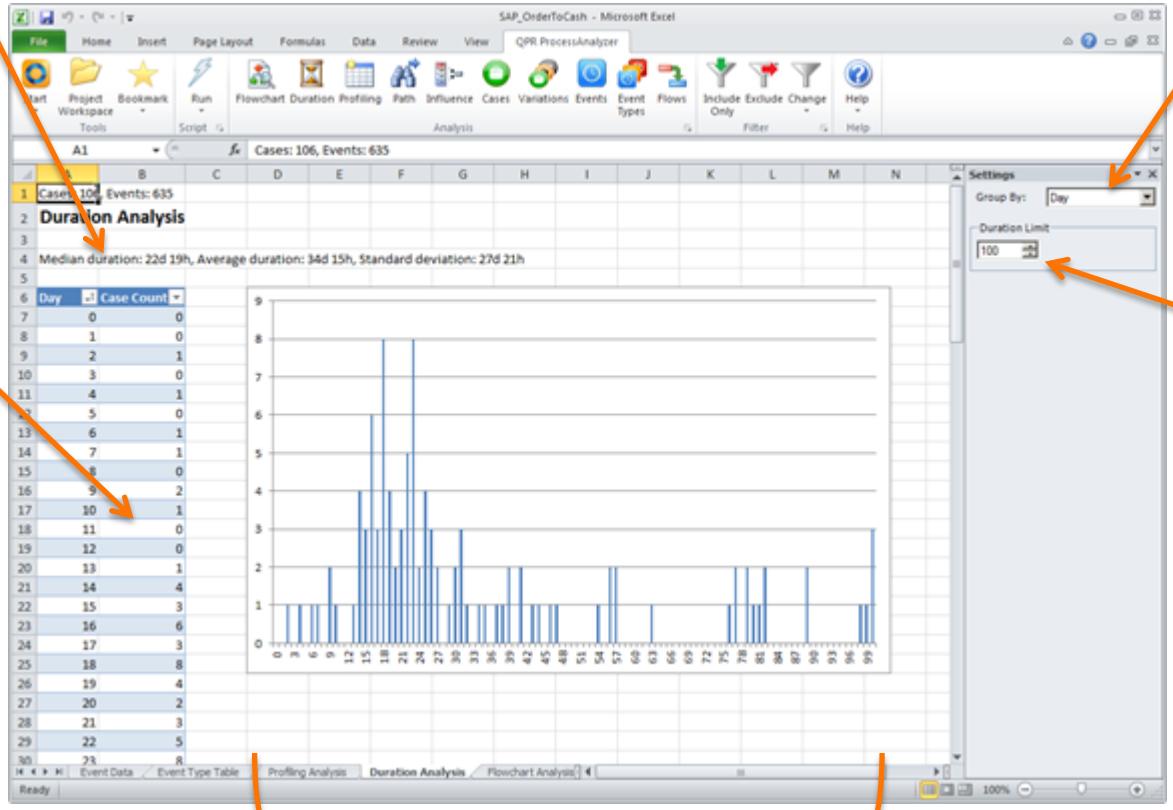
Total duration: average / median / std of Durations from first event to last in each Case

Select resolution

Currently rounded to nearest integer; (in future ceiling)

Collect values bigger than this to last bin

Select for filtering or analysis focus

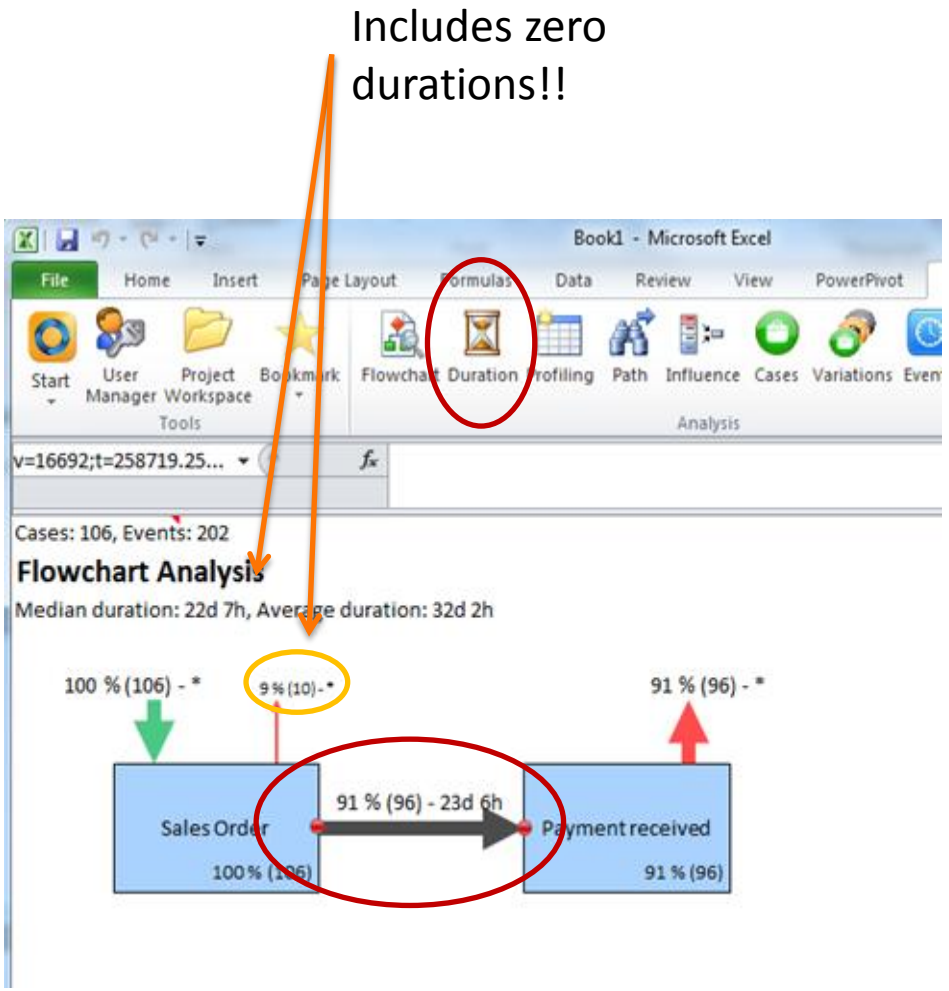


Distribution

© QPR Software

Duration

- Problem: we wish to see specifically the lead time ”Sales order – Payment received”
  - Flowchart with all event types shows lead times for immediate transitions
- Include only the wanted start / end event types (Sales Order, Payment received)
  - Note: 9% of cases do not reach Payment received
    - These contribute 0s to average / median!
  - Select the flow order-payment
  - Run ”duration”



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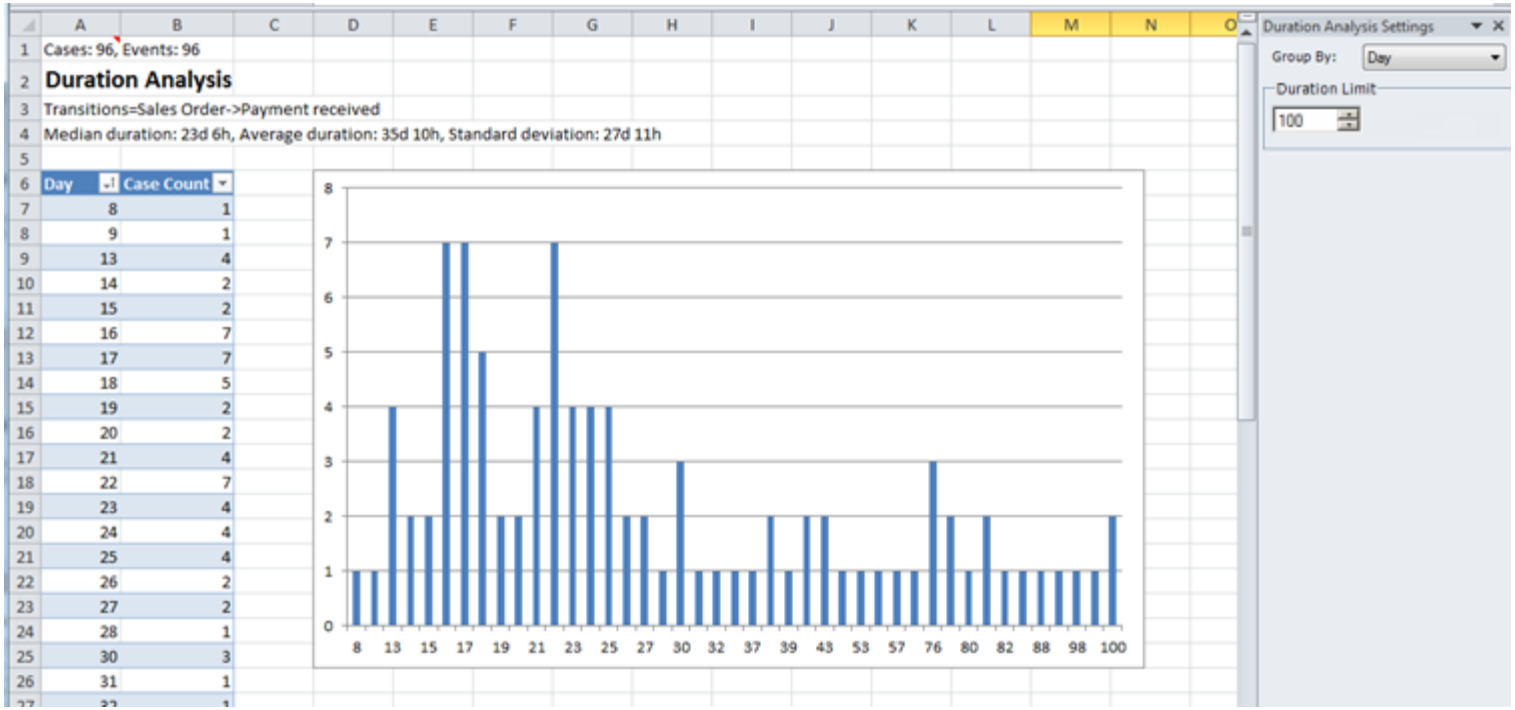
Duration

- Final total lead time analysis for Sales Order – Payment received
  - 96 cases include a path from Sales Order to Payment received



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Duration

- Note:
  - QPR ProcessAnalyzer always uses full calendar time between event timestamps
  - It is currently not possible to count time ”on office hours only” or other similar logic
  - In order to emulate this kind of logic, the original data should be manipulated accordingly

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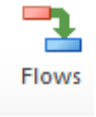
Flows

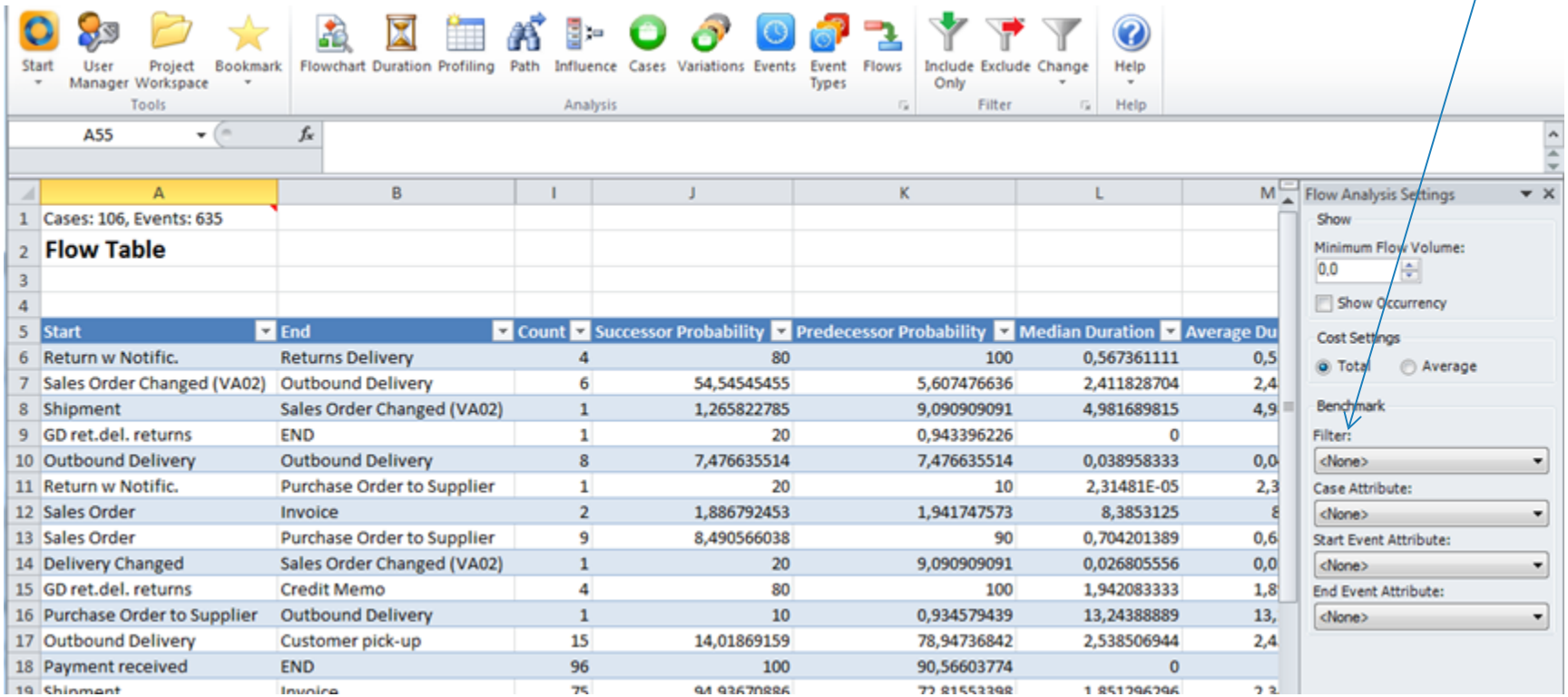
Tabular reports
Detailed metrics and comparison

Flows



- Shows the Flowchart in tabular format
- Ideal for detailed conformance checking
- ”Pivot table trick” (see next slide)

Benchmarking!



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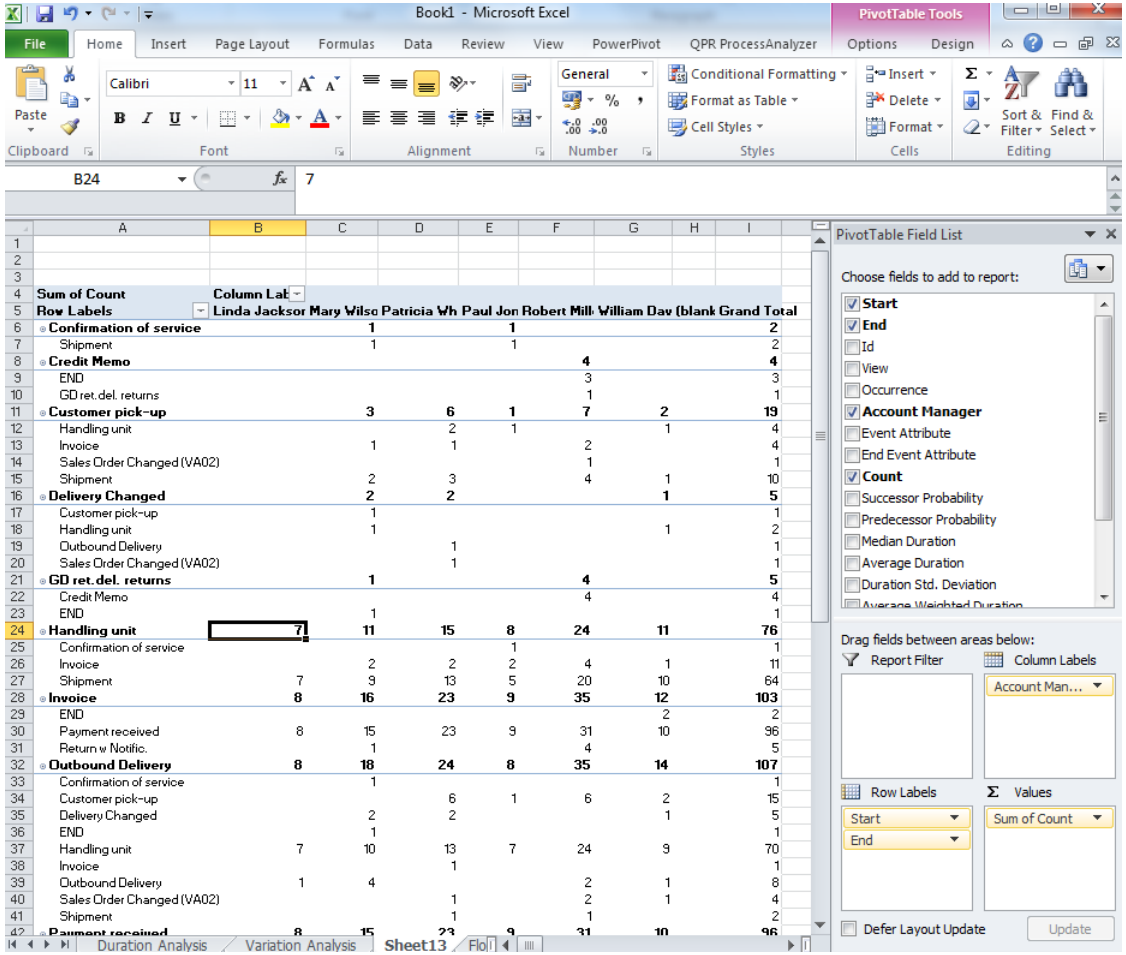
Advanced: Pivot table trick

- Use Excel pivot table to analyze the Flows table
  - Example of detailed comparison of process flow by account manager
  - Applies also to lead times etc.



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Influence Analysis

Explanations
Root causes

Influence

- To ease and speed up the discovery, we have ready-made analyses in the product
- Variations
  - how many there really are: have a holistic look
- Root cause analysis
  - Look at a variation from the model and discover which case attributes have an impact (and how much) to the variations
  - Script: say that how easily users can drill down from the flowchart to ’deeper’ information
  - The influence analysis allows for quick prioritization of corrective actions and gives an inclination of where the problem lies straight from the product – no need for extensive/time-consuming process mining/data mining/calculations etc.

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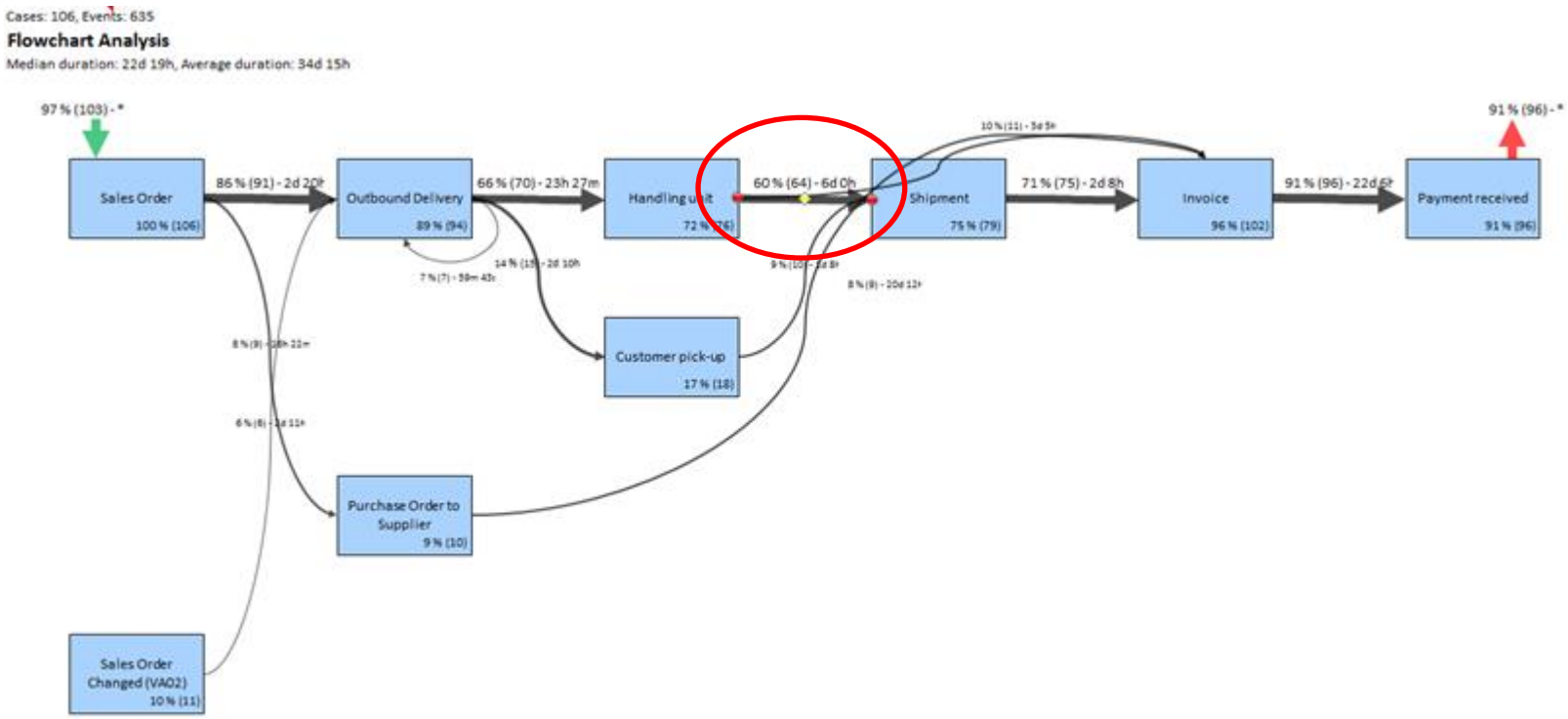

Bottleneck discovery (duration)

Notice that it takes 6 days, in most cases, from the Handling Unit to go to Shipment. That is unusual and needs further investigation. Select the Duration tab.

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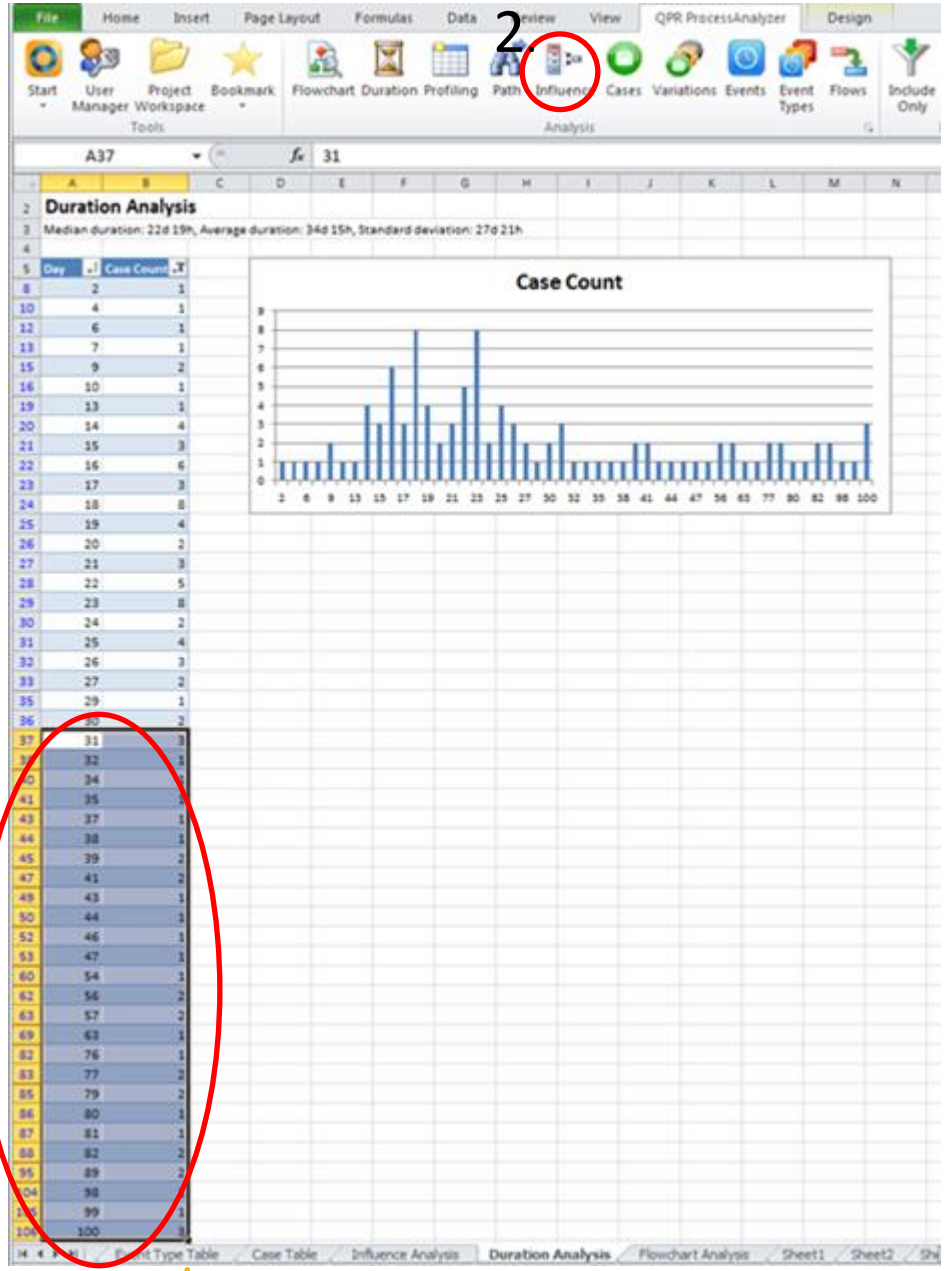

Bottleneck discovery

In the Duration Analysis you can see all cases and their duration. Discover that there are deliveries taking more than 30 days...

1. Select those cases from the table.
2. Click the Influence tab.

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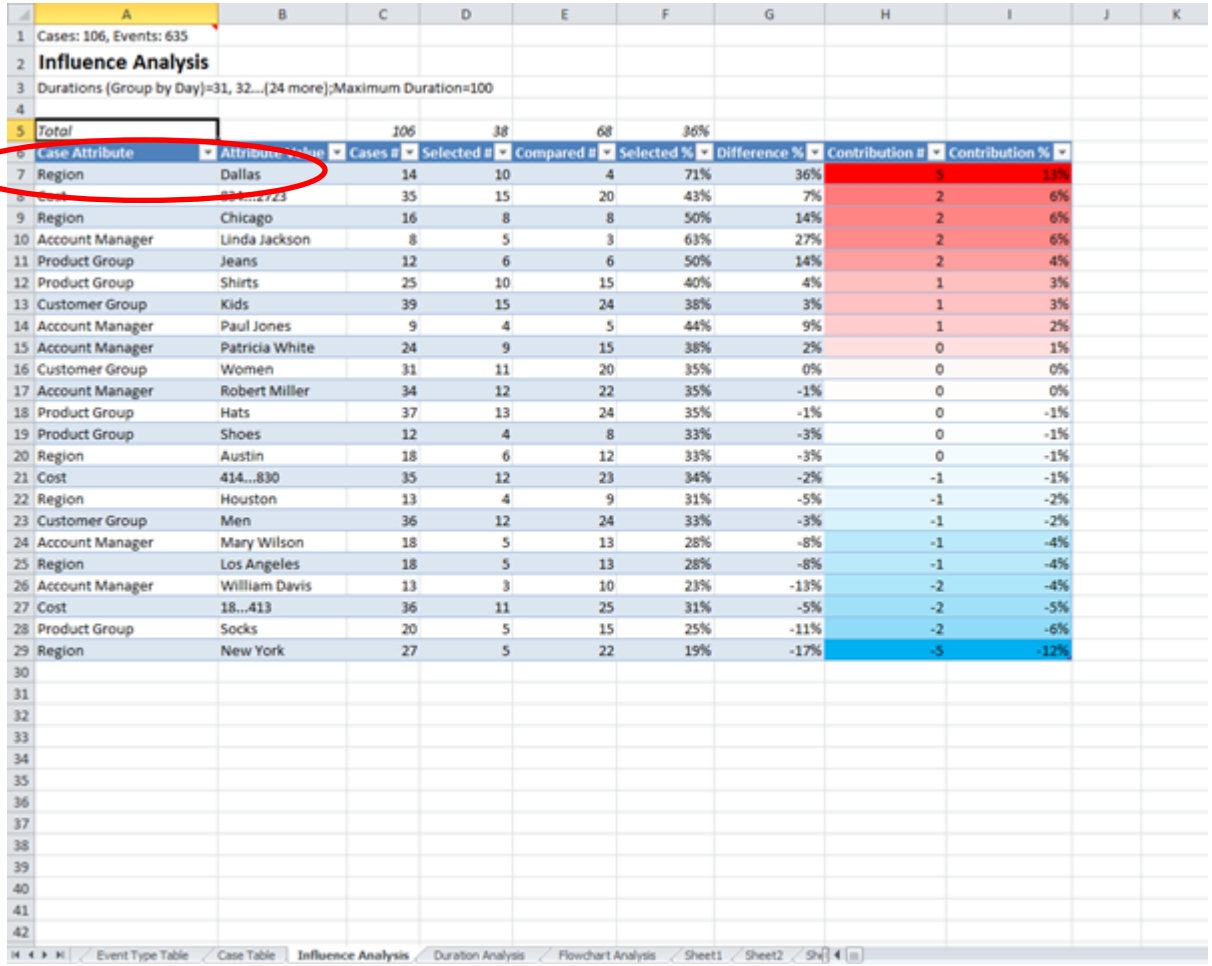

Cases: 106, Events: 635

Influence Analysis

Durations (Group by Day)=31, 32...(24 more);Maximum Duration=100

	Case Attribute	Attribute Value	Cases #	Selected #	Compared #	Selected %	Difference %	Contribution #	Contribution %
Total			*106*	*38*	*68*	*36%*			
	Region	Dallas	14	10	4	71%	36%	5	13%
	Cost	834...2723	35	15	20	43%	7%	2	6%
	Region	Chicago	16	8	8	50%	14%	2	6%
	Account Manager	Linda Jackson	8	5	3	63%	27%	2	6%
	Product Group	Jeans	12	6	6	50%	14%	2	4%
	Product Group	Shirts	25	10	15	40%	4%	1	3%
	Customer Group	Kids	39	15	24	38%	3%	1	3%
	Account Manager	Paul Jones	9	4	5	44%	9%	1	2%
	Account Manager	Patricia White	24	9	15	38%	2%	0	1%
	Customer Group	Women	31	11	20	35%	0%	0	0%
	Account Manager	Robert Miller	34	12	22	35%	-1%	0	0%
	Product Group	Hats	37	13	24	35%	-1%	0	-1%
	Product Group	Shoes	12	4	8	33%	-3%	0	-1%
	Region	Austin	18	6	12	33%	-3%	0	-1%
	Cost	414...830	35	12	23	34%	-2%	-1	-1%
	Region	Houston	13	4	9	31%	-5%	-1	-2%
	Customer Group	Men	36	12	24	33%	-3%	-1	-2%
	Account Manager	Mary Wilson	18	5	13	28%	-8%	-1	-4%
	Region	Los Angeles	18	5	13	28%	-8%	-1	-4%
	Account Manager	William Davis	13	3	10	23%	-13%	-2	-4%
	Cost	18...413	36	11	25	31%	-5%	-2	-5%
	Product Group	Socks	20	5	15	25%	-11%	-2	-6%
	Region	New York	27	5	22	19%	-17%	-5	-12%

Event Type Table | Case Table | Influence Analysis | Duration Analysis | Flowchart Analysis | Sheet1 | Sheet2

Bottleneck discovery (influence)

You can see that ”Dallas” is strongly related to deliveries with an exceptionally long lead time.

© QPR Software

Details of Influence view

- Contribution
  - Make a selection in the data (by using cases, event types, variations etc.)
    - The selected group = S, others = O
  - Contribution calculation counts first the number cases in S and O.
    - Say that #S =100 and #B=900. (S = 10% of all cases)
  - Select an attribute value, e.g. ”User”
  - Contribution calculation proceeds by counting how many cases belong to S for each distinct value of the selected attribute ”User”.
    - Say that for User = Mary there are 50 cases altogether, 25 S’s and 25 O’s
    - If the attribute ”User” would not affect anything at all, one expects there to be 10%*50 = 5 S’s and 90%*50= 45 O’s.
  - The attribute values are now ordered according to the difference between the observed = 25 and neutral assumption = 5 => + 20
  - In some cases the relative frequency might be more useful

- Subset
  - Done for any type of variable if #unique values > # of subsets x 10
  - The values are sorted and splitted into equal size bins
  - Say that you have values 1-1000, subset = 3 => There would be three bins: 1-333, 333-666, 666-1000
  - Note
    - Sound only for ordered attributes
    - ...but currently done for any type of variable (e.g. Names), even if it does not make sense
    - This should be remembered especially if you use selection ”All”

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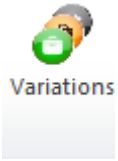
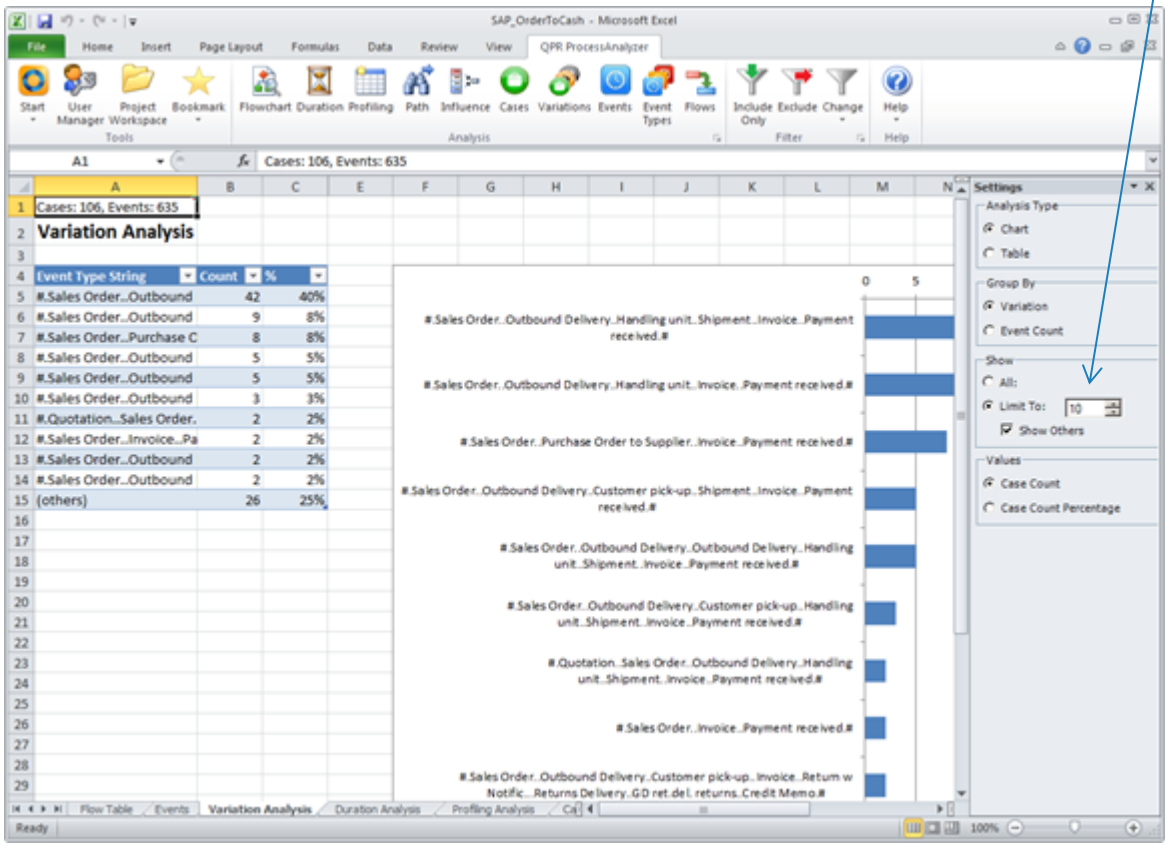
Variation Analysis

Variations



- A variation is a unique sequence of events
  - The attributes and durations may differ
- Use for detailed conformance checking
- The distribution describes process heterogeneity

Change to expand / suppress the list



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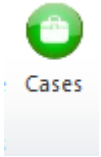
Case Analysis Events

Drill-down
Statistics
Enrichment

Case Analysis



- Case based reasoning
  - Drill-down to individual case level and check the data (attributes)
- Use for creating data for further analysis
  - Example: classify by event type combinations
    - Count change events and compare durations for different combinations of changes etc.
  - Example: Create new case attributes
    - Make new attributes based on old and import them
    - Examples:
      - currency conversion
      - classify cases based on total duration
      - classify cases based on start month / end month

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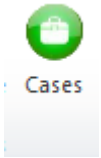
Case Analysis

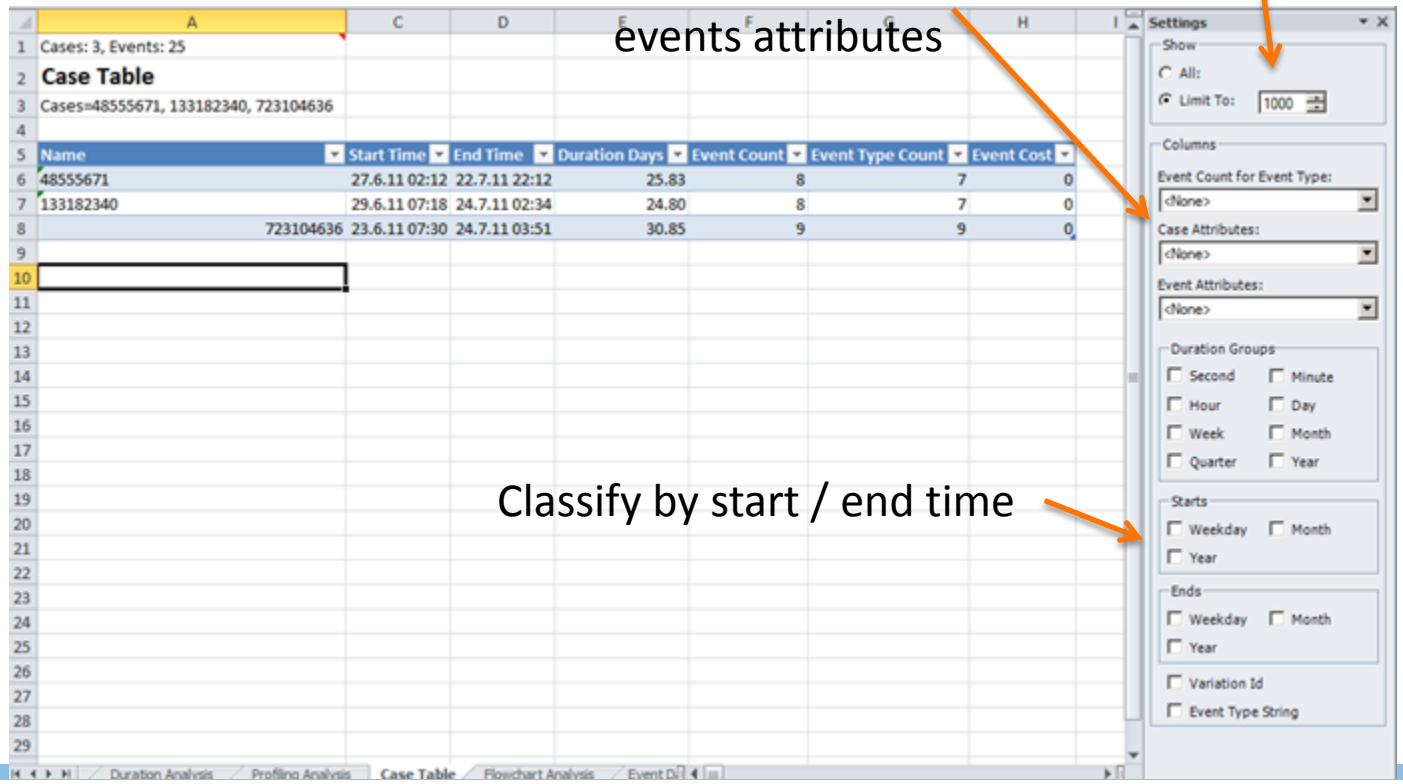


- Drill-down to individual case level and check the data (attributes)
- Use for creating data for statistical analysis
- Create new case attributes

Remember to set to ”All” if you require all cases!

Characterize case by number of events or events attributes

Classify by start / end time



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Event Analysis

- Retrieve events for most detailed check

SAP_OrderToCash - Microsoft Excel

File | Home | Insert | Page Layout | Formulas | Data | Review | View | QPR ProcessAnalyzer

Start | User Manager | Project Workspace | Bookmark | Flowchart | Duration | Profiling | Path | Influence | Cases | Variations | Events | Event Types | Flows | Include Only | Exclude | Change | Help

Tools | Analysis | Filter | Help

A642

Cases: 106, Events: 635

Events

Case	Event Type	Start Time	Cost	Total Cost
114483567	Sales Order	24.5.11 02:25	0	451
79545494	Sales Order	24.5.11 09:38	0	620
61426559	Sales Order	24.5.11 21:59	0	507
2003679498	Sales Order	25.5.11 09:03	0	2380
884989895	Sales Order	26.5.11 16:09	0	2723
2003679498	Outbound Delivery	27.5.11 02:31	0	2380
79545494	Outbound Delivery	27.5.11 03:31	0	620
114483567	Outbound Delivery	27.5.11 04:21	0	451
61426559	Outbound Delivery	27.5.11 17:35	0	507
214692511	Sales Order	28.5.11 00:27	0	1191
79545494	Handling unit	28.5.11 04:00	0	620
2003679498	Handling unit	28.5.11 09:12	0	2380
61426559	Handling unit	29.5.11 02:09	0	507
91460943	Sales Order	30.5.11 04:06	0	565
61426559	Shipment	30.5.11 14:48	0	507
214692511	Outbound Delivery	31.5.11 04:01	0	1191
38244356	Sales Order	1.6.11 01:36	0	228
61426559	Invoice	1.6.11 06:35	0	507
91460943	Outbound Delivery	1.6.11 09:16	0	565
214692511	Handling unit	1.6.11 15:04	0	1191
79545494	Invoice	1.6.11 16:42	0	620
91460943	Handling unit	2.6.11 01:05	0	565
163174049	Sales Order	2.6.11 04:39	0	995
214692511	Shipment	2.6.11 12:02	0	1191

Settings

Maximum Row Count

All:

Limit To: 1000

Event Attributes:

<None>

Events | Variation Analysis | Duration Analysis | Profiling Analysis

Ready

100%

© QPR Software

Keeping on track with things

Filter management
Bookmarks

Keeping on track with things

- Filters
  - Each time you include/exclude, a new filter is created to the filter stack.
  - You can select any of the filters at any stage for analysis, and even rename them for convenience.
  - Complete filter stack opens from the ribbon
    - You can edit and view filter details in ”Properties”
- Bookmarks
  - Filters do not store any other information on analysis views than the case/event type selection
  - *Bookmark stores the Analysis view* (Flowchart, Profile, Influence,...) as such (=the analysis type + the filter + any parameter selections). When you create a bookmark, you may rename it for convenience.
- Status info: Cell A1
  - The comment box shows details of the current analysis
  - *Attach the text into possible questions sent to Customer Care*

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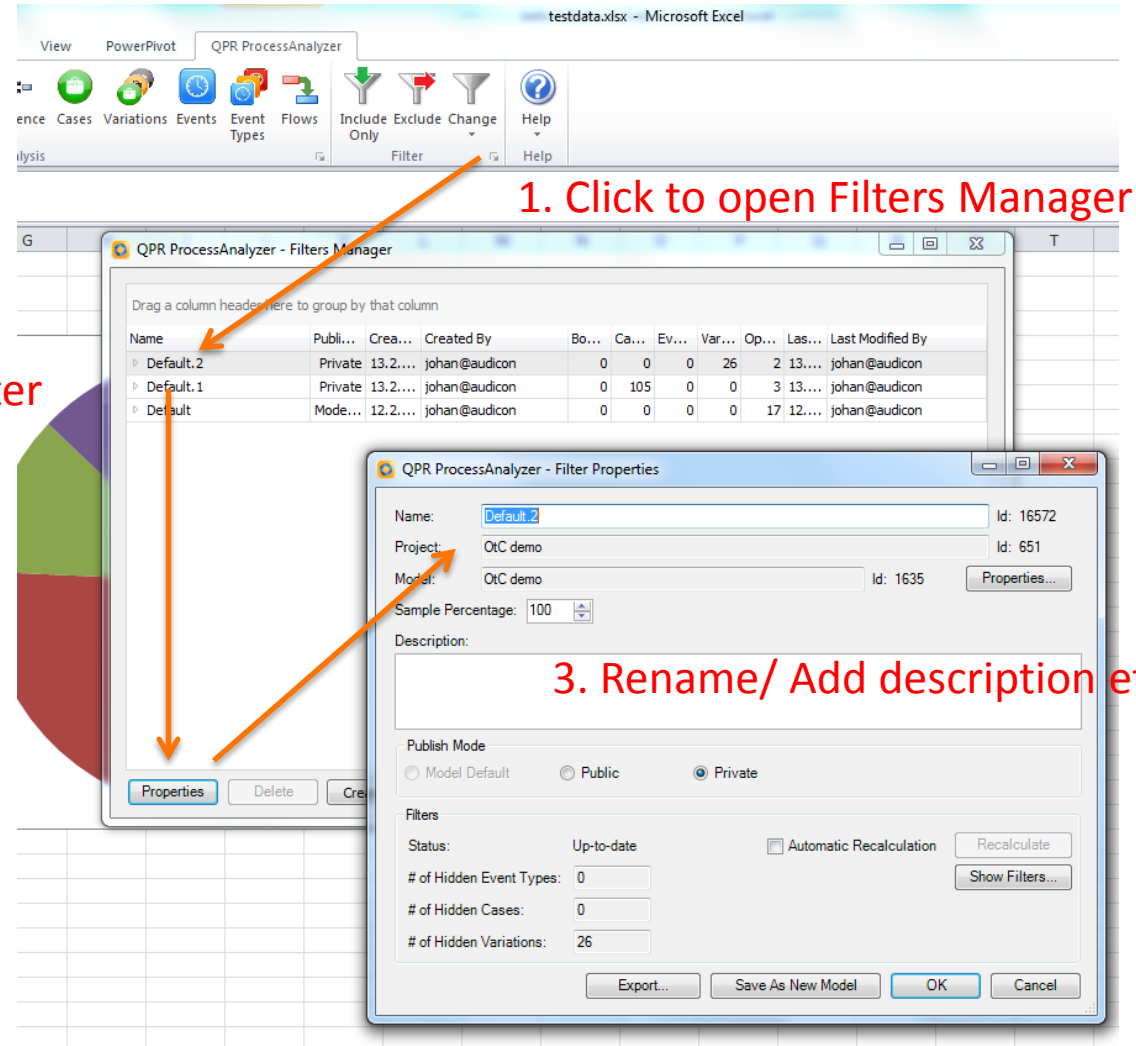
Manage filters

Managing / tracking filters

”Change” button gives a quick list

See Wiki for details



And /or show properties...

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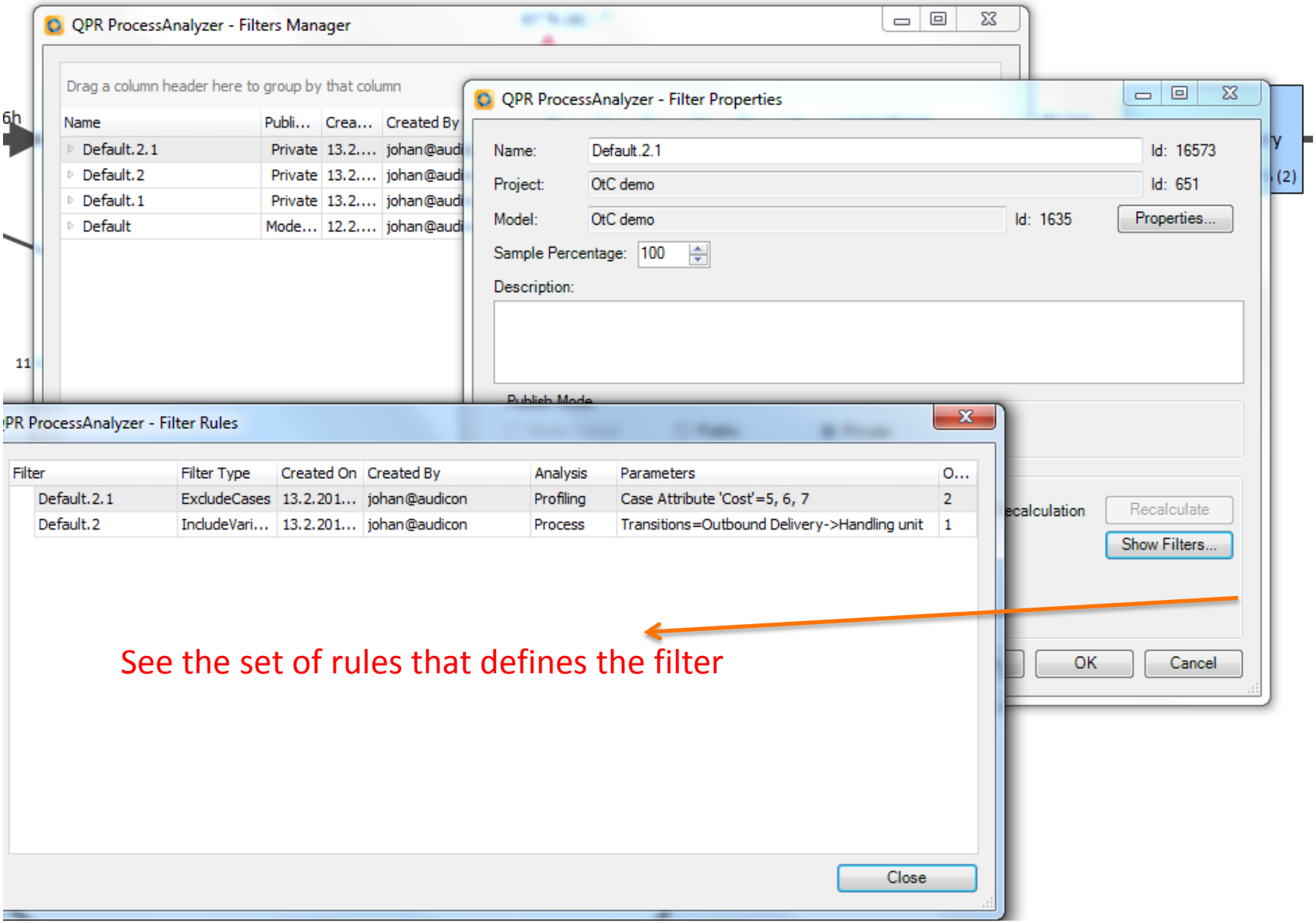

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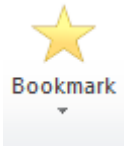
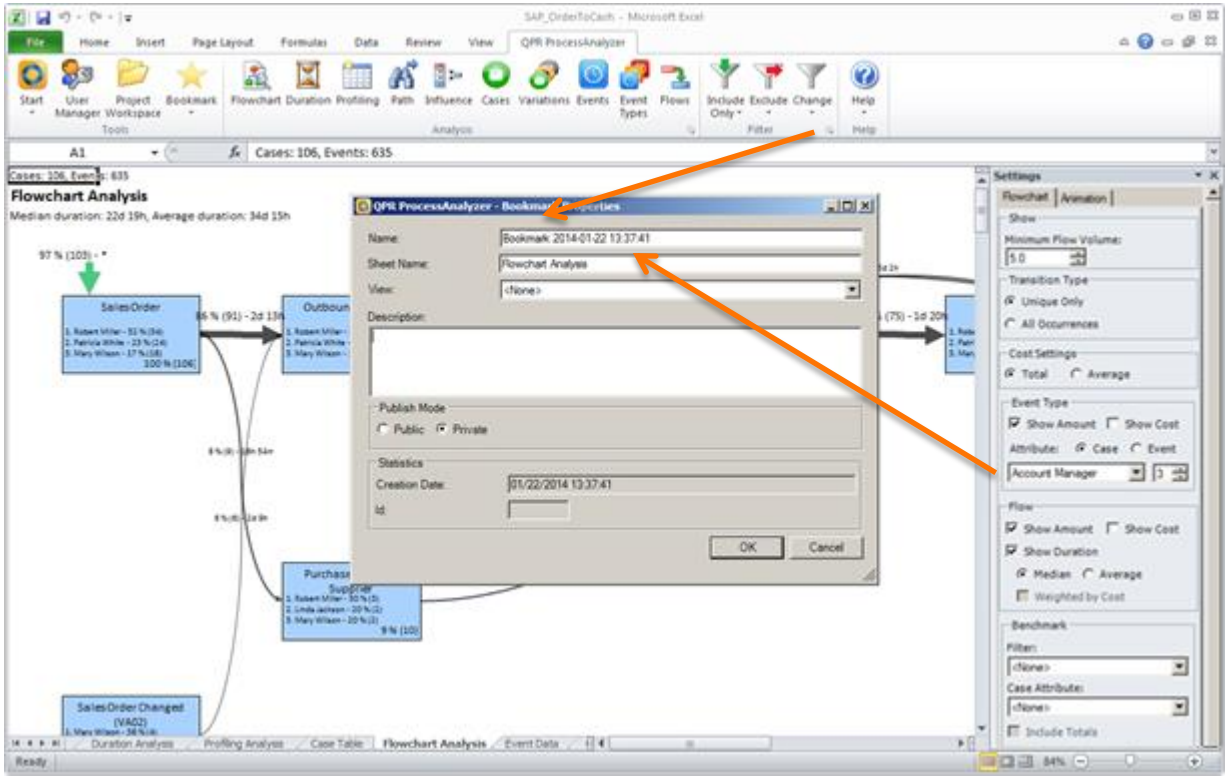
Bookmarks

Bookmarks



- Bookmark stores the analysis view
  - Filters
  - Analysis settings
- Tip:

  You can change the default Excel sheet name in order to produce results on a specified sheet and prevent overwriting the on-going analysis.



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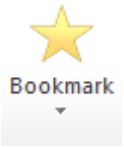
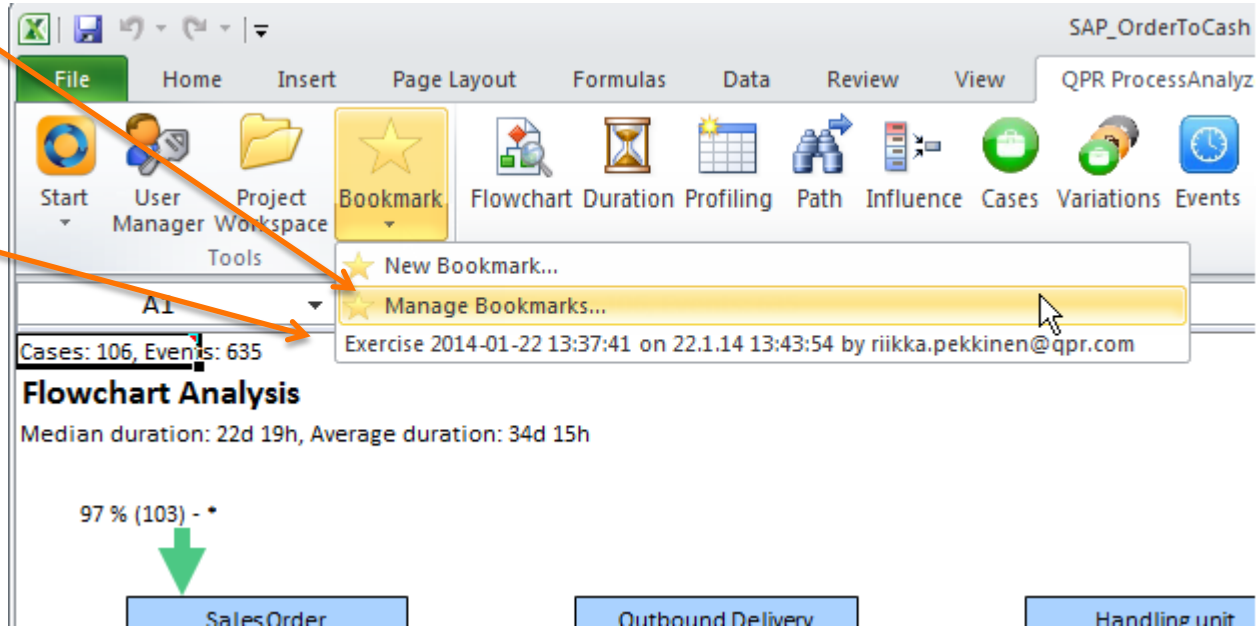
Bookmarks



Edit bookmarks

Recall a bookmark



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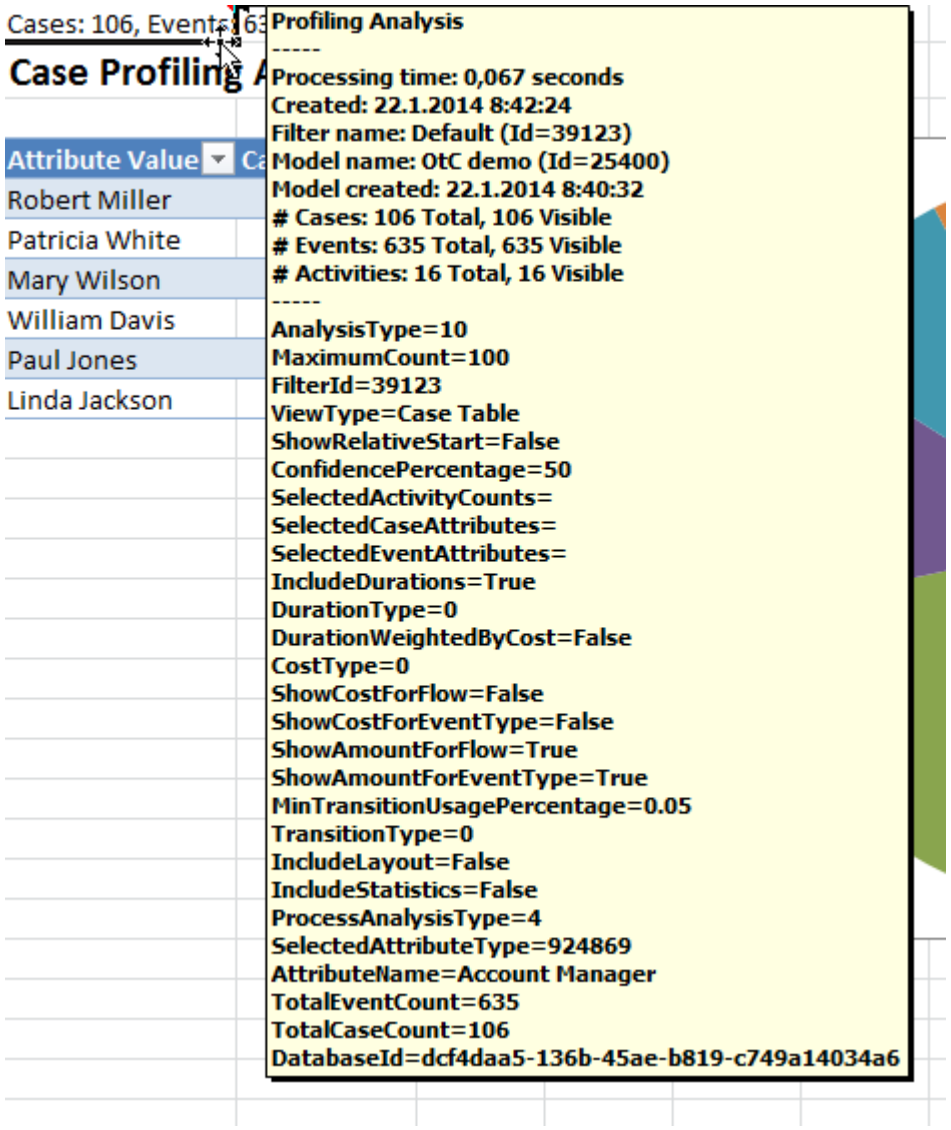
Status info

”Cell A1”

Status cell A1

- Provides detailed information on analysis. For example:
  - Run time
  - Filter
  - View and model identification
  - Amount of data
  - Analysis parameters
  - Important information for CustomerCare



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Distributing the results

Distributing Excel reports
Web UI

QPR ProcessAnalyzer Web UI

- Can be utilized for similar process analysis tasks as Excel add-on, but is especially useful when:
  - you cannot, for some reason, utilize the Excel add-on
  - when your customer – internal or external – cannot utilize the Excel add-on
  - when you present pre-defined analysis results (bookmarks) and want discussion for these results between stakeholders
- Can be accessed from any modern web browser

© QPR Software

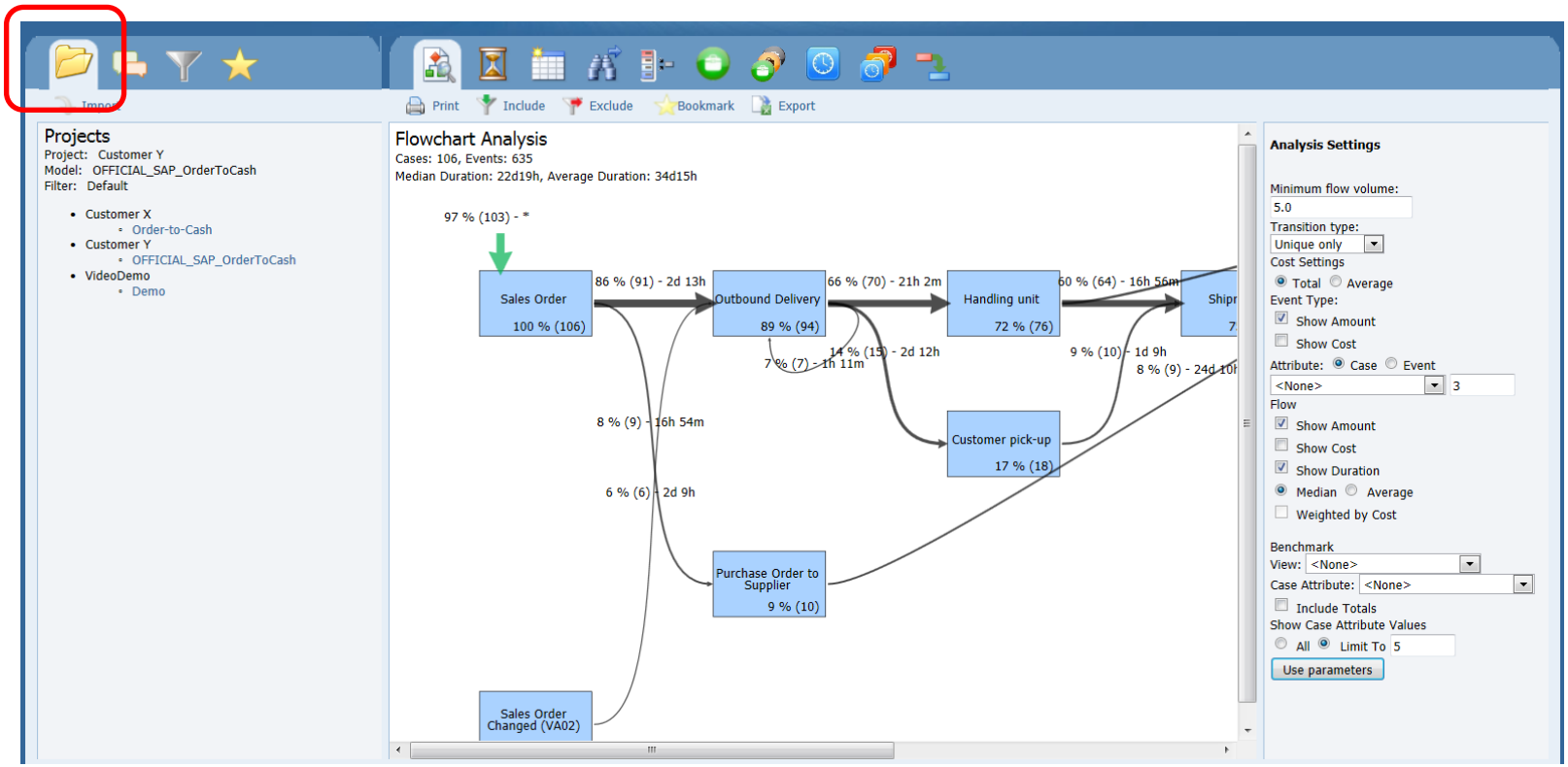
How to access Web UI

- Browse to address http://processanalyzer.qpr.com/global
- Enter your QPR ProcessAnalyzer login name and password to the corresponding fields and click Login

© QPR Software

Basic usage

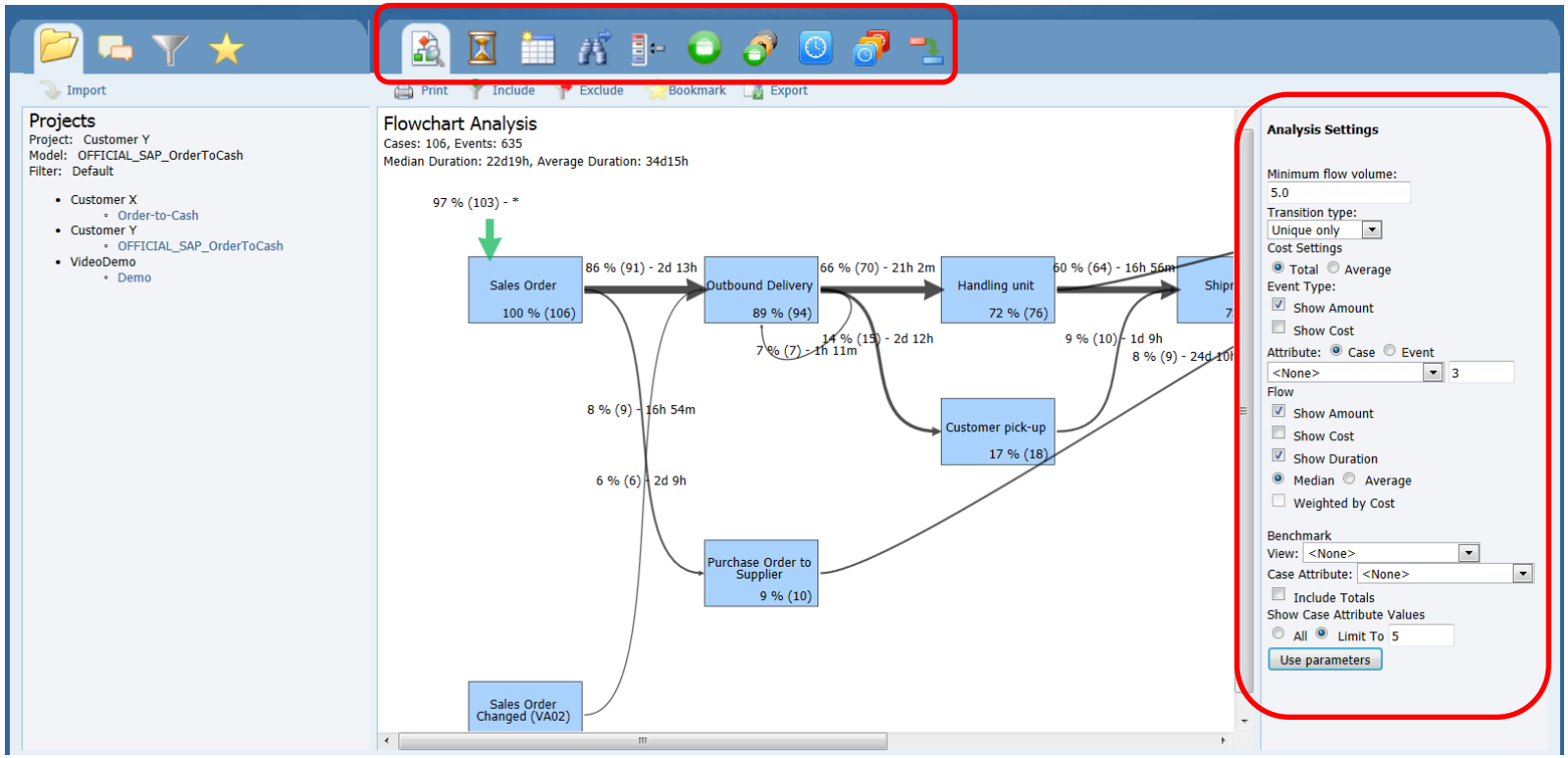
- Once you have logged in, you can access all projects and models that you have access to by selecting the ”Projects” folder from top-left corner of the screen



© QPR Software

Basic usage

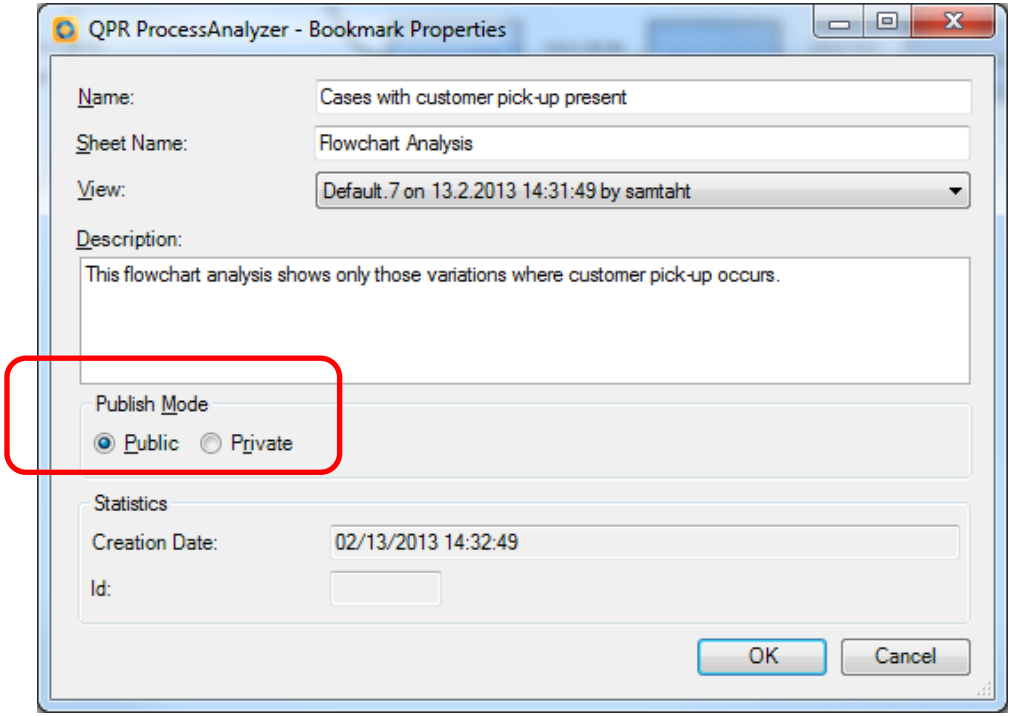
- By clicking the analysis icons on the top of the screen you can access different analyses. You can also change analysis settings from the right-hand side of the screen.



© QPR Software

Bookmarking reports

- When you have created a public bookmark in Excel add-in while creating analyses, these bookmarks are visible to all users that can access the project.



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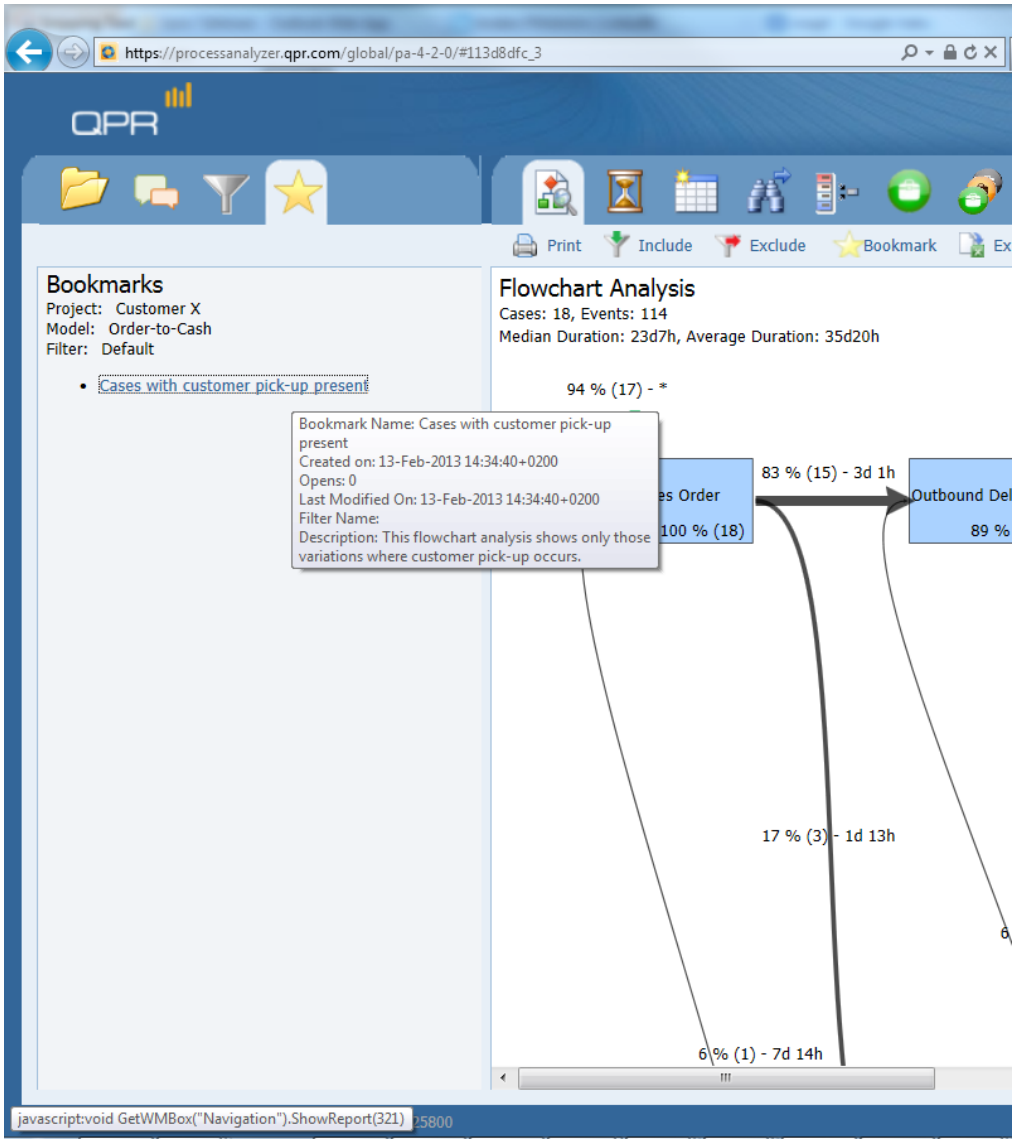
Bookmarking reports

- After the public bookmark has been saved, it appears in the ”Bookmarks” tab of the Web UI.
- This way, you can deliver analysis results easily to different stakeholders within the organization, or possibly for external organizations.



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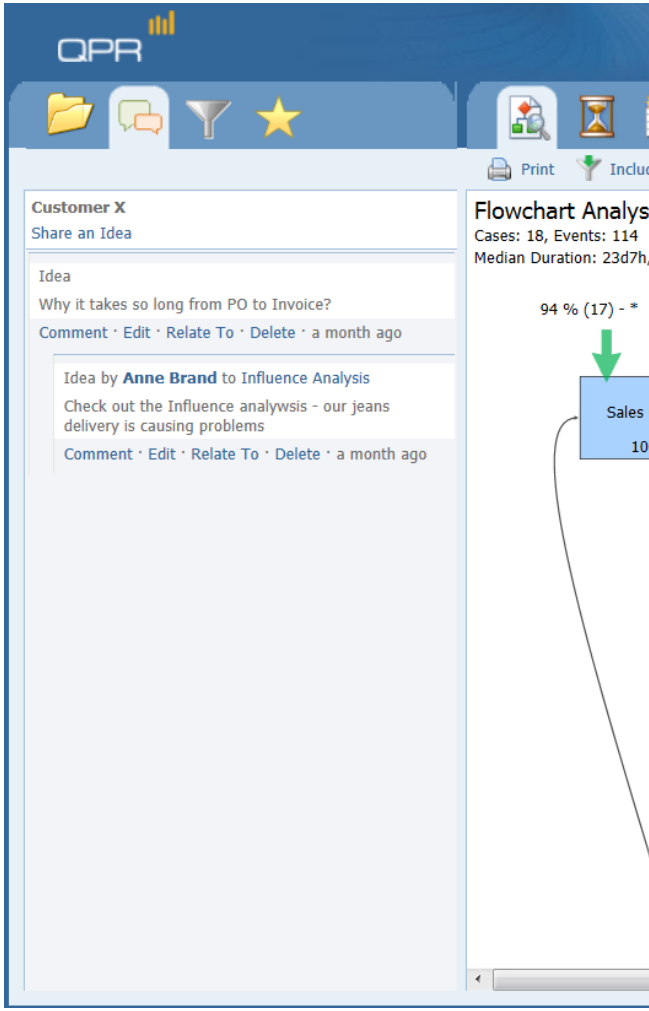
Collaborating with the analysis results

- By selecting the ”Collaboration” tab on the top right side of the screen, you can communicate with other users that have sufficient rights to the model.
- You can create new comments, reply to other users’ comments, and attach a specific view to a comment by clicking the ”Relate To” link when creating or editing a comment.



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Keeping on track with things

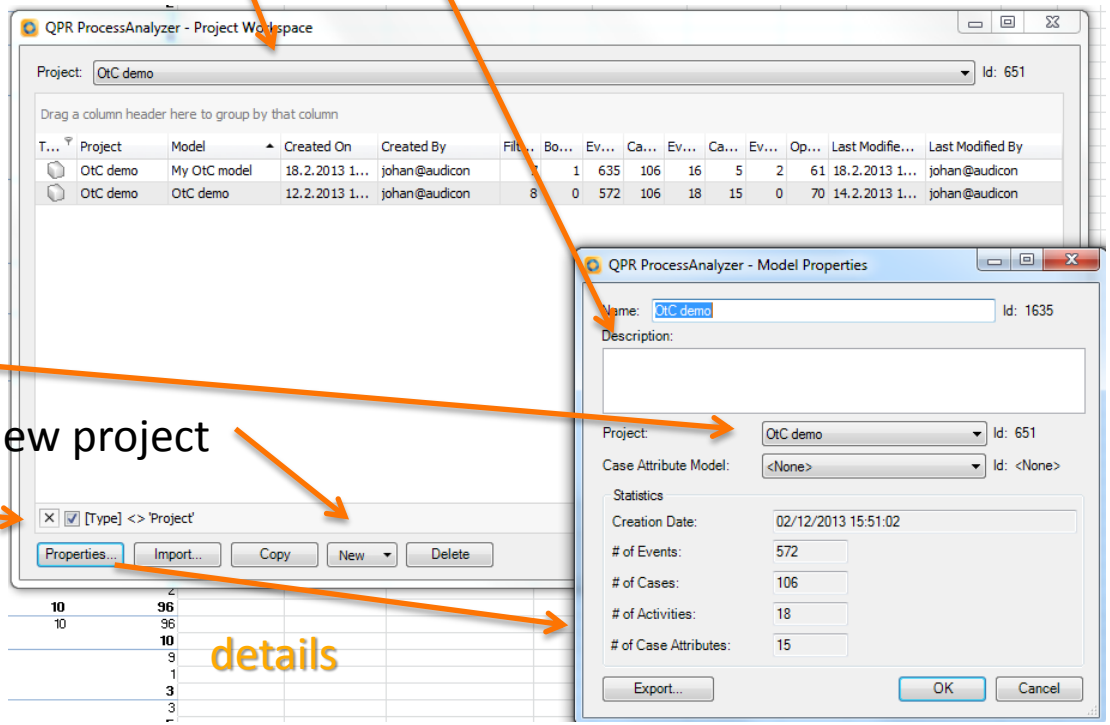
Models and Projects, Export
User management and user rights

Projects and models

- Project is a folder into which the models are organized
  - Models inherit the project access rights
  - Note: if you move a model from one project to another, it inherits the access rights of its new parent project

Switch project

Add comments



Move this model to another project

New project

Uncheck to list both projects and models

details

Export as pacm-file
(can be imported in ”Import”)

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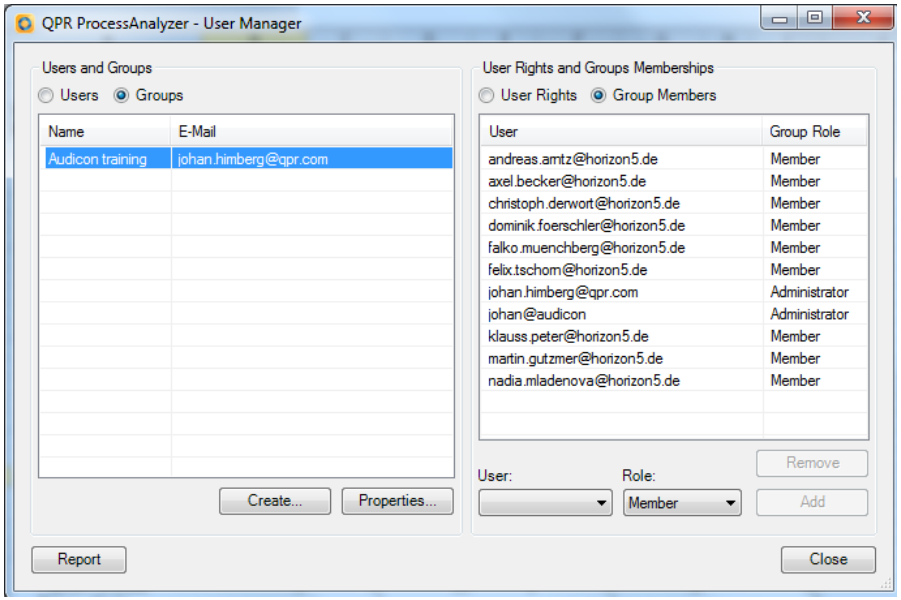
User management / groups

- See WIKI for details



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User rights

User Roles and Rights: <All>

The "<All>" level user right refers to the QPR ProcessAnalyzer Service.

Role	Create Project	Create Model	Import Model	Import Data	View Model	Create Filters/Analyze Model	Delete Model
Administrator	✔	✔	✔	✔	✔	✔	✔
Model Creator	✔	✔	✔	✔			
Evaluator	✔	✔	✔	✔			

- Evaluator and Model Creator get the project Administrator role for the projects that he/she creates (see User Roles and Rights for Individual Projects below). He/she can delete models in the created projects only.
- There is a maximum number of 10 models the Evaluator can create, and each model can contain a maximum of 1000 events, event attributes, and case attributes each.

User Roles and Rights for Individual Projects

Role	Create/Import Models	Assign User Roles	View Models	Create Filters/Analyze Model	Import Data	Delete Model
Administrator	✔	✔	✔	✔	✔	✔
Analyzer			✔	✔		
Designer			✔	✔	✔	✔
Viewer			✔			

- Note that the Administrator role here refers to the project.

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Enrichment of the data

Advanced example

Problem

- We wish to
  - Evaluate how many cases start /month

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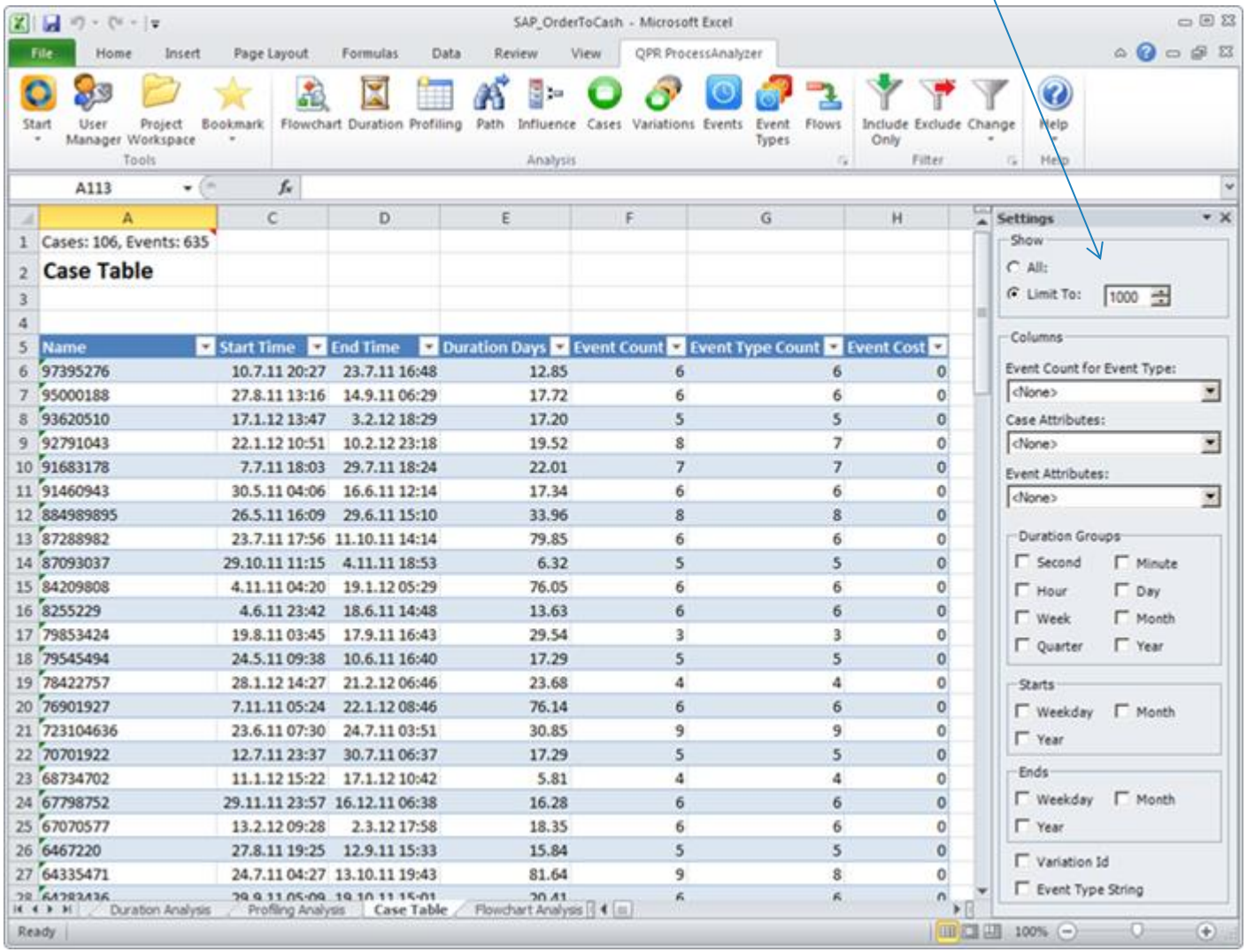
Retrieve case data

Make sure that you get everything (set to ”All” if more than 1000 events)



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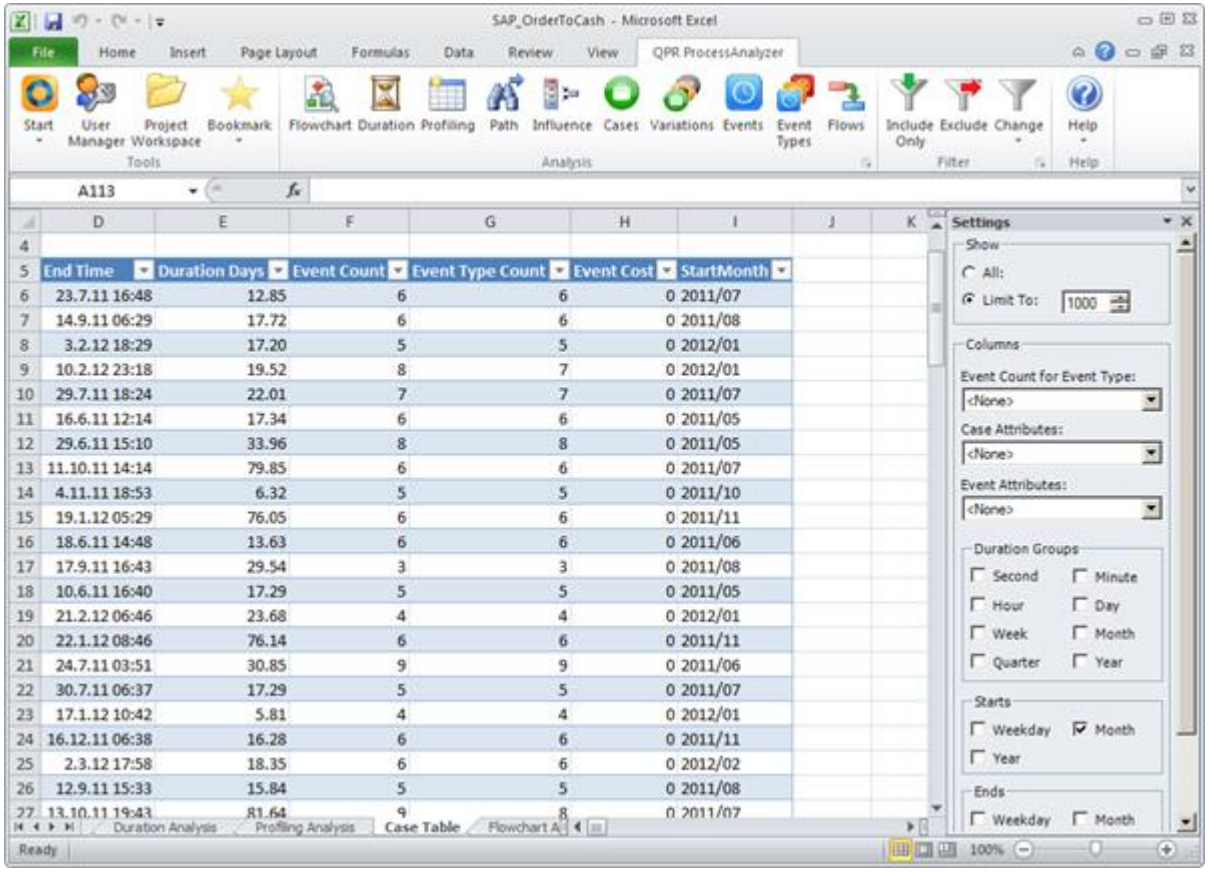
Make a new case attribute

- Use Start Month



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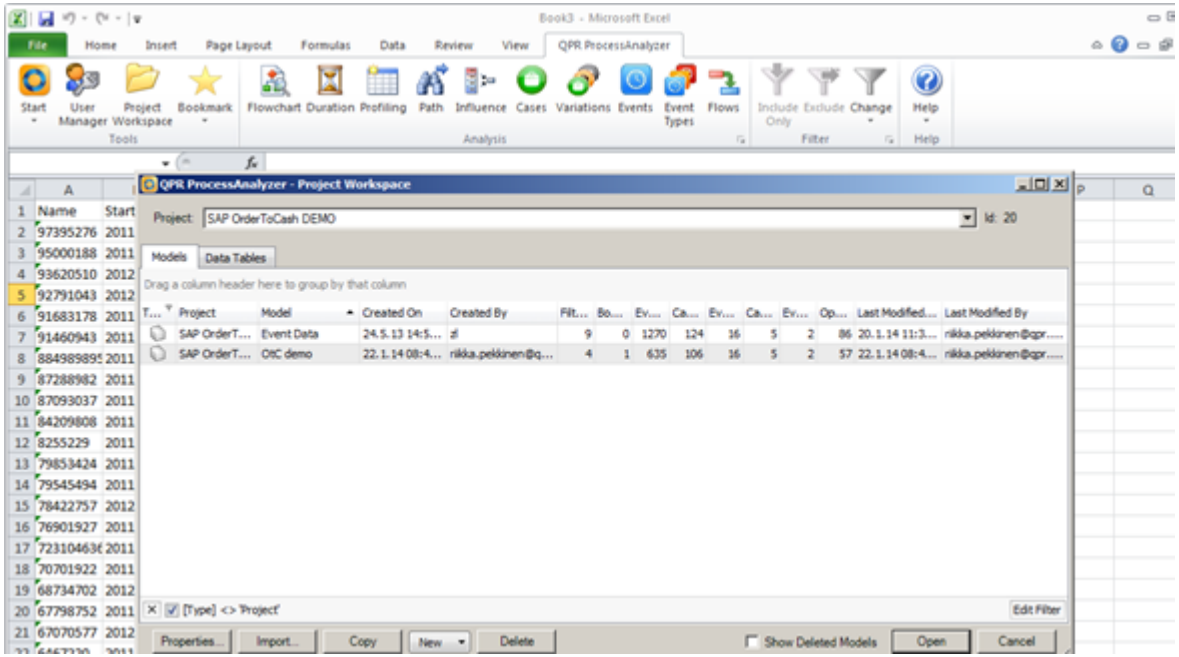
Prepare data for import

- Make an ”importable” data set
- Copy to an empty sheet
  - Delete extra information and headers
- Import as Case attributes



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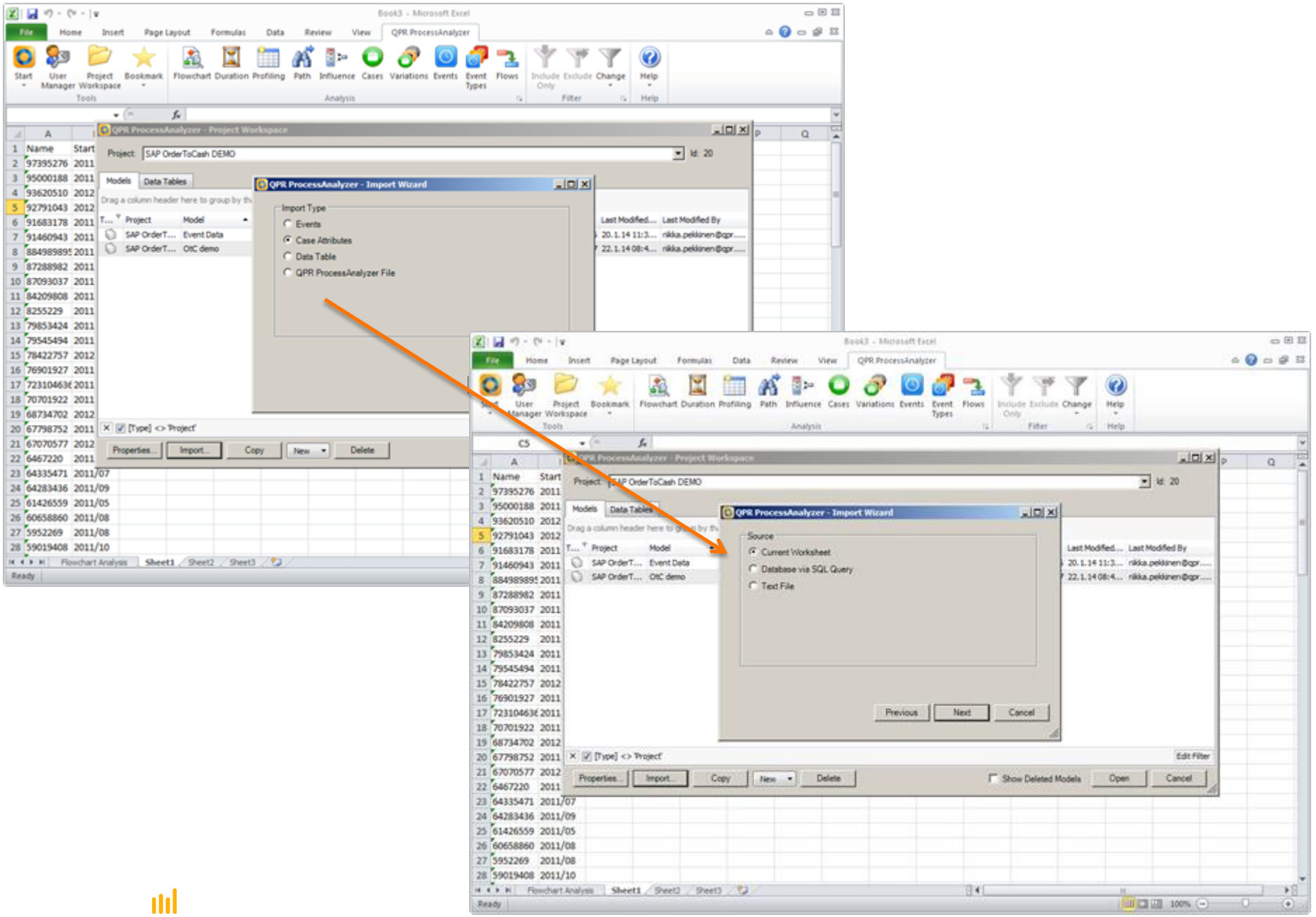

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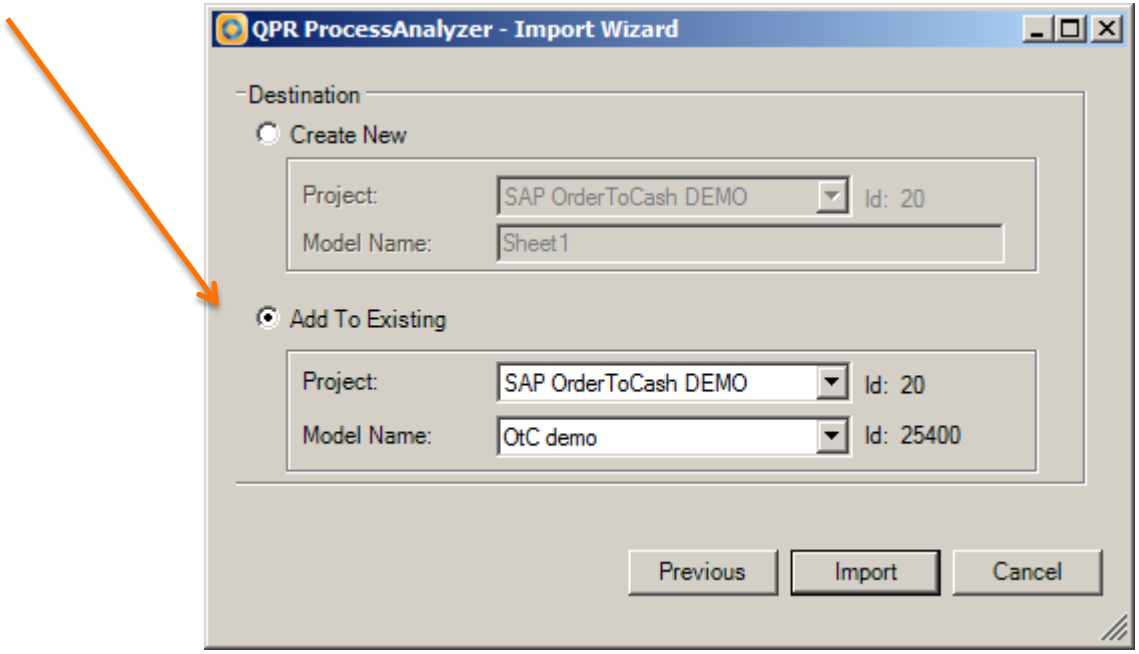
Import

- Remember to choose ”Add to Existing”
  - Project / model name may be different in the screenshot than in your example



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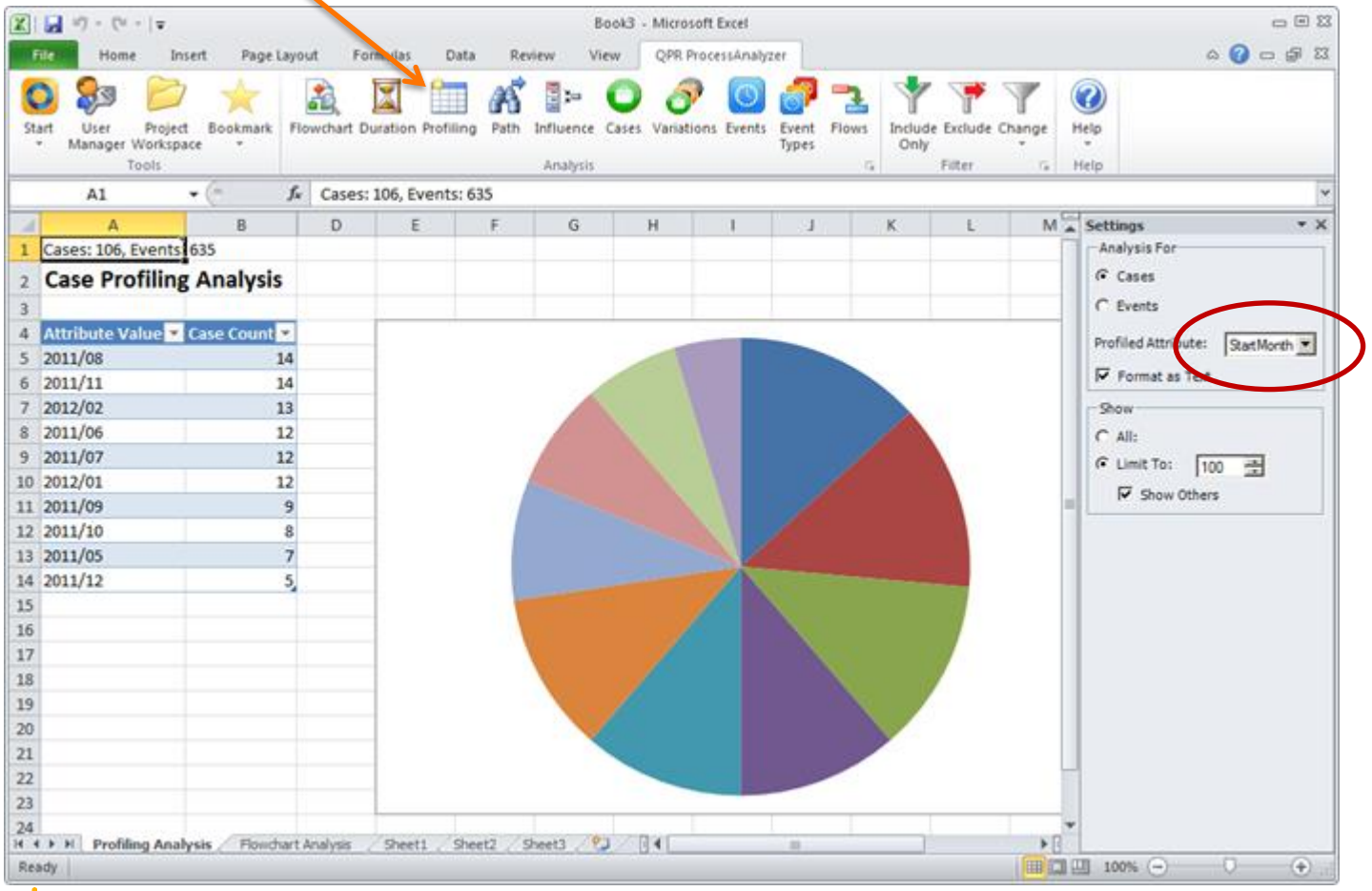
Profile

- Profile the new case attribute ”Start Month”



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Excel tricks...

- Tip: Change the graph in Excel
  - Pie chart is not good for time series data

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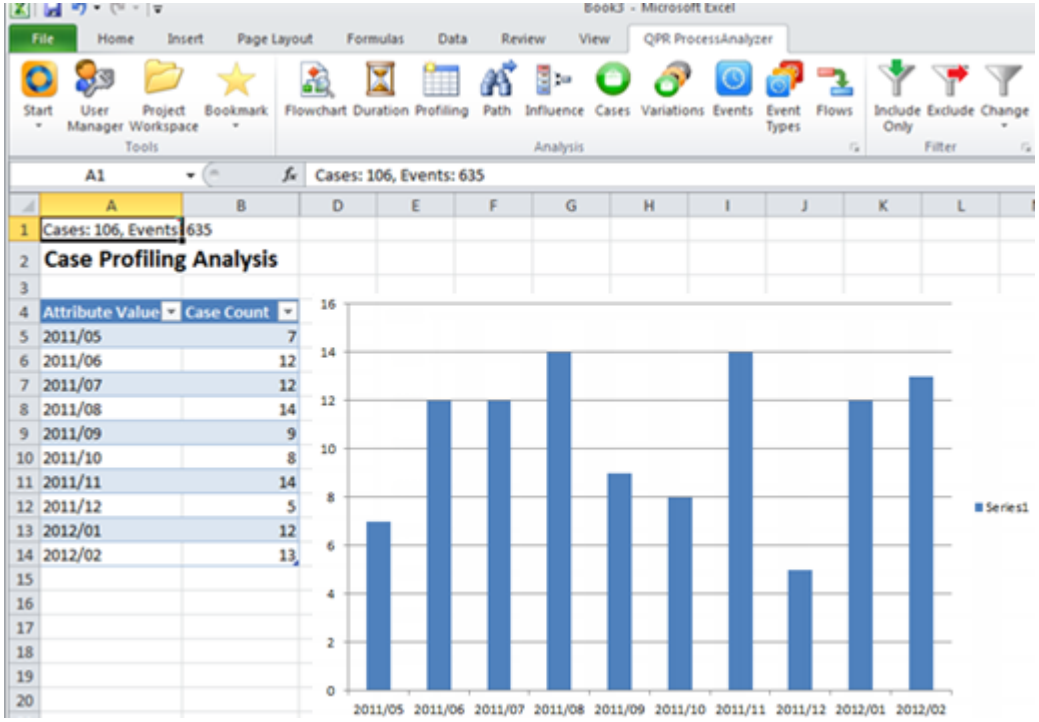
Final statistics

- Sort and you'll see number of Orders /month
  - Typical thing to do when validating the consistency between the source system and QPR ProcessAnalyzer

sort



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Advanced

Compare monthly lead times

Problem

- We wish to
  - benchmark the OtC process by start month
  - compare the monthly cycle time

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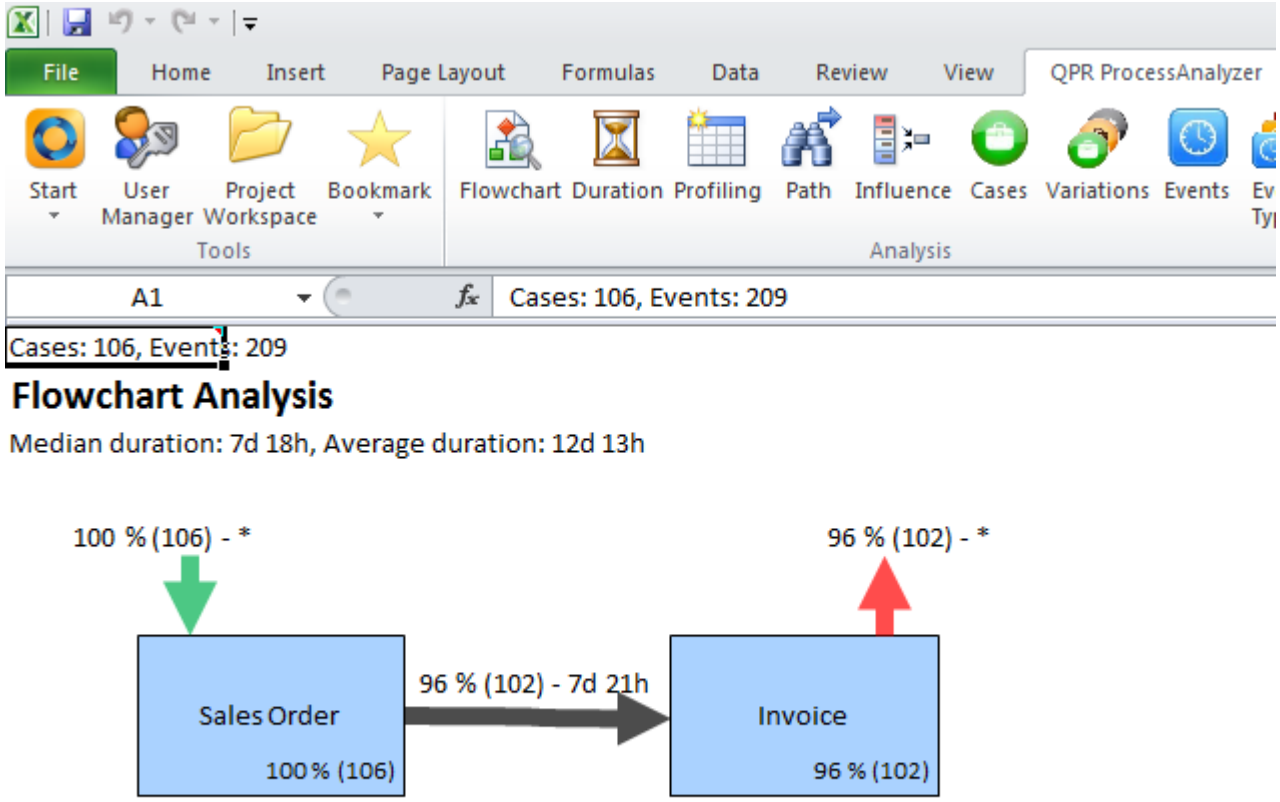
...continue

- Select the lead time of interest by appropriate filtering



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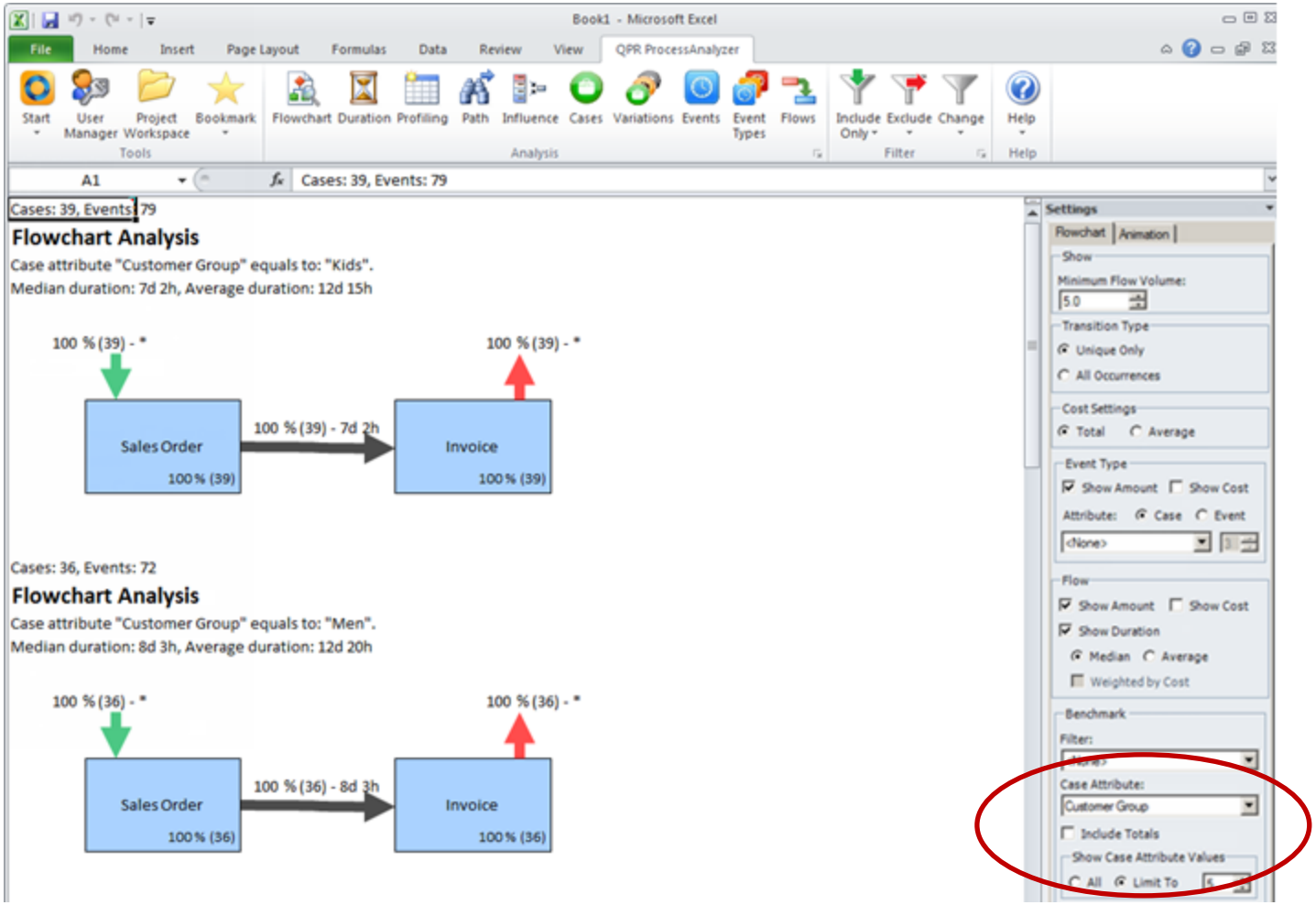
Benchmark



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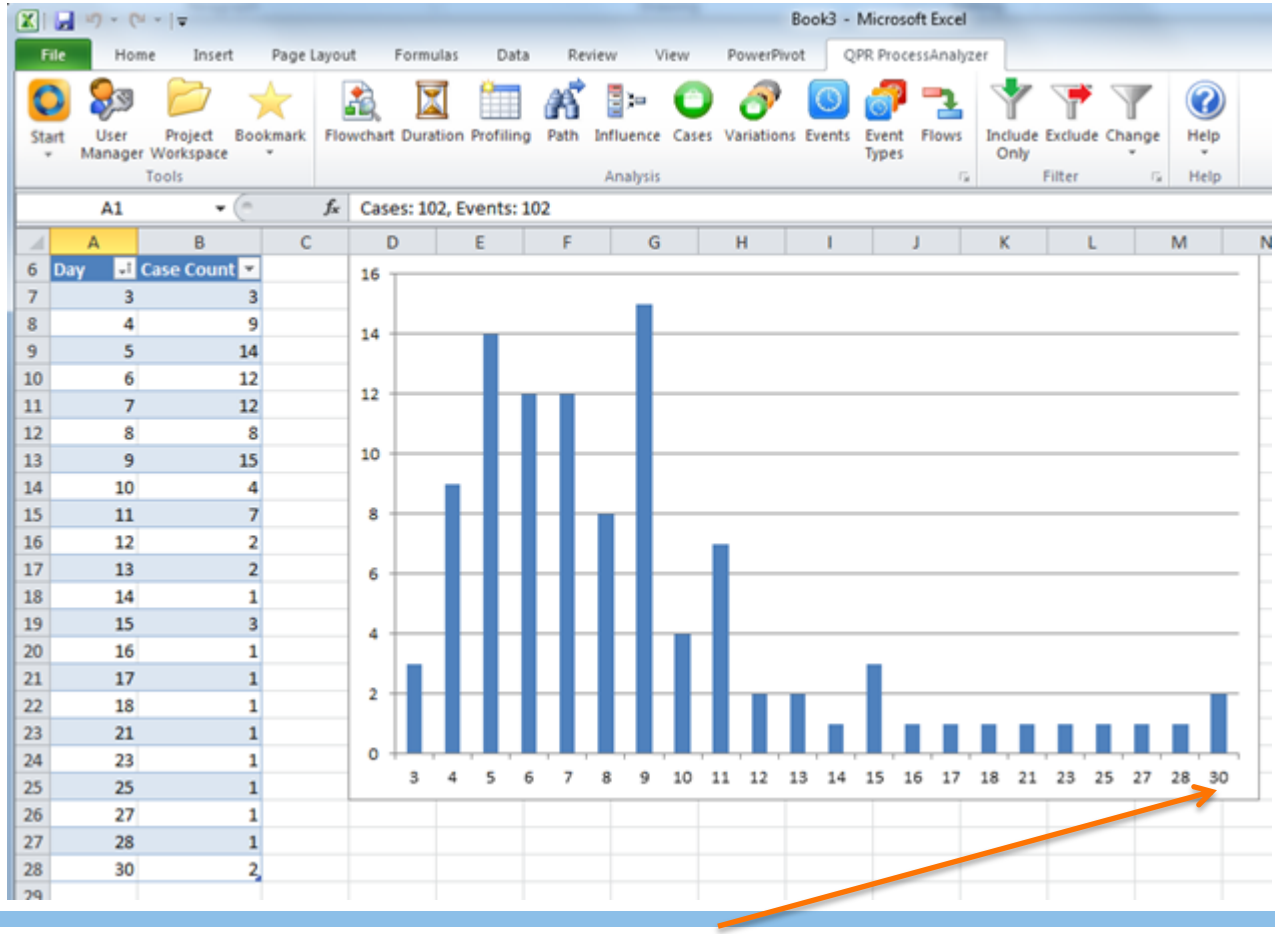
Check time-window consistency

- Check how long lead times exist
- Filter if necessary



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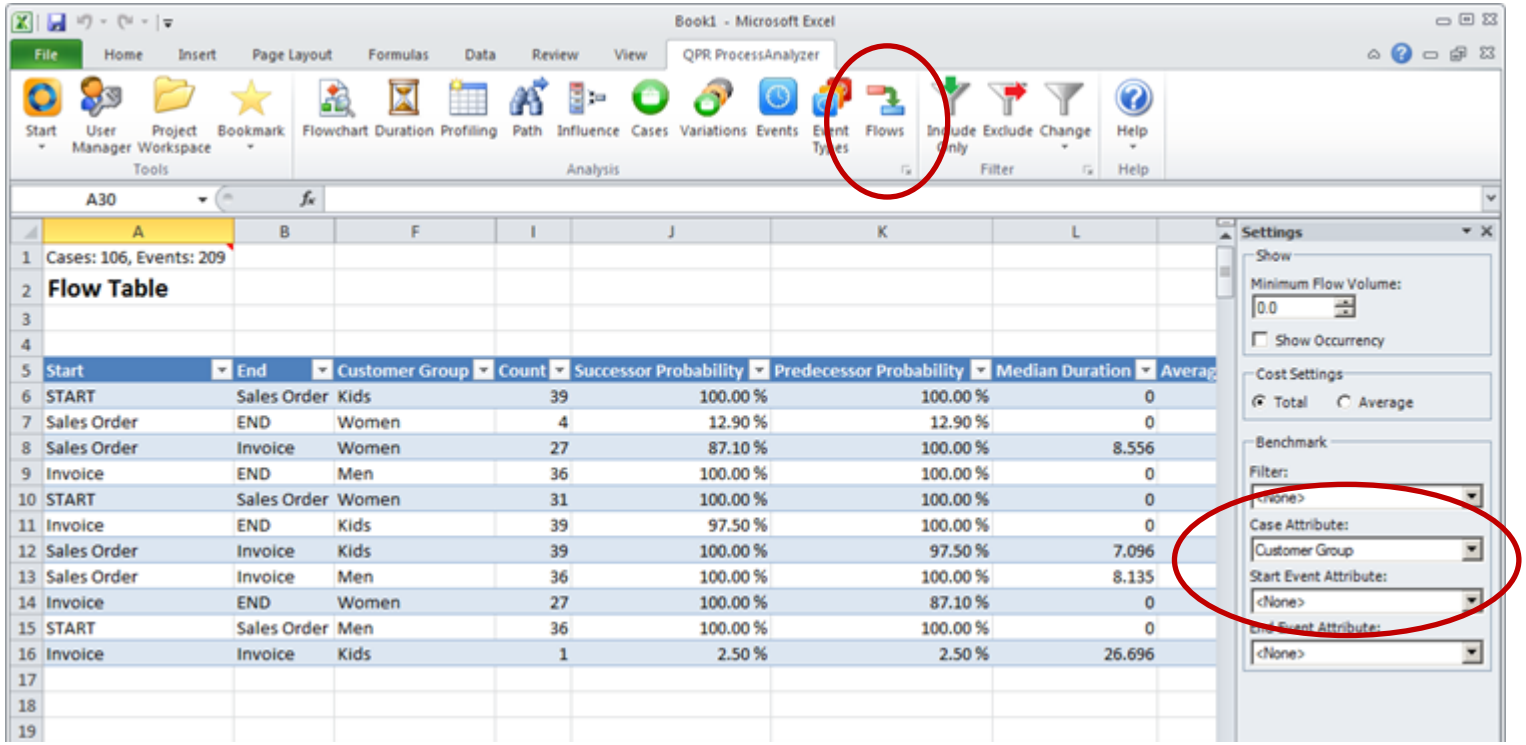
Flows

- Use the flow report to make nice graphs



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Exercises
Further information

Individual exercises

The data in this Excel workbook can be used to find answers to following 10 exercise questions:

1. How big percentage of orders is invoiced?

2. What product is most often delivered by Supplier?

3. What are the 3 most common reasons for the order to be returned by customer (“Return w Notific.”)

4. Which customer group is most likely to change their Order?

5. What is the total cost of all Sales Orders?

6. What is the total cost of Orders that are returned with notification?

7. What is the most important reason for OrderToCash process to last for more than 80 days?

8. Comparing to average orders, what is the main reason for those orders to take so much time?

9. What is the most common process variation and how many orders belong to that variation?

10. What is the Order Number (name) of the order where the sales order is changed after the shipment has been done?

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QPR ProcessAnalyzer Certification Test

- By taking this test, you can certify yourself as a QPR ProcessAnalyzer Business User
- The test measures your knowledge in the key concepts of QPR ProcessAnalyzer and proficiency in using the software for analyzing data
- The test is available from QPR Customer Care on request
- For more information, see Wiki

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Further Information

- Wiki: http://devnet.qpr.com/pawiki
- Support area: http://www.qpr.com/products/qpr-processanalyzer-support.htm
- ABPD group in LinkedIn: http://www.linkedin.com/groups/Automated-Business-Discovery-Professionals-3325777

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