



Universidad de Granada

decsai.ugr.es

Practical Process Mining (I)

Master CD&IC

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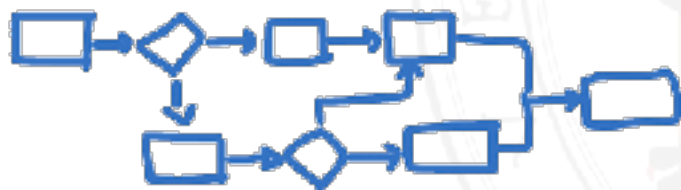


DECSAI

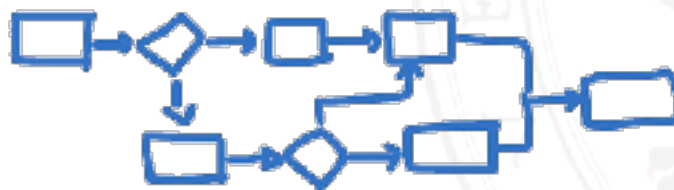
**Departamento de Ciencias de la
Computación e Inteligencia Artificial**

1. **Introduction to practical Process Mining and Adaptive Case Management**
2. **DISCO Process Miner**
 1. **Tour**
 1. **Dataset PurchasingExample**
 2. **Dataset DBA1516**
 3. **Dataset DBA1516-noargs**





Fixed
Environment
Predictable
behaviour



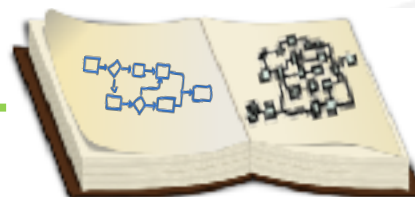
Likely path → Unlikely path →

Fixed
Environment
Predictable
behaviour

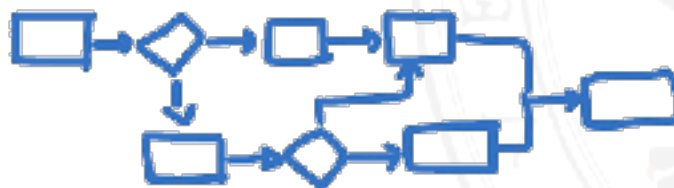


Strict Processes

Reference



Non actionable

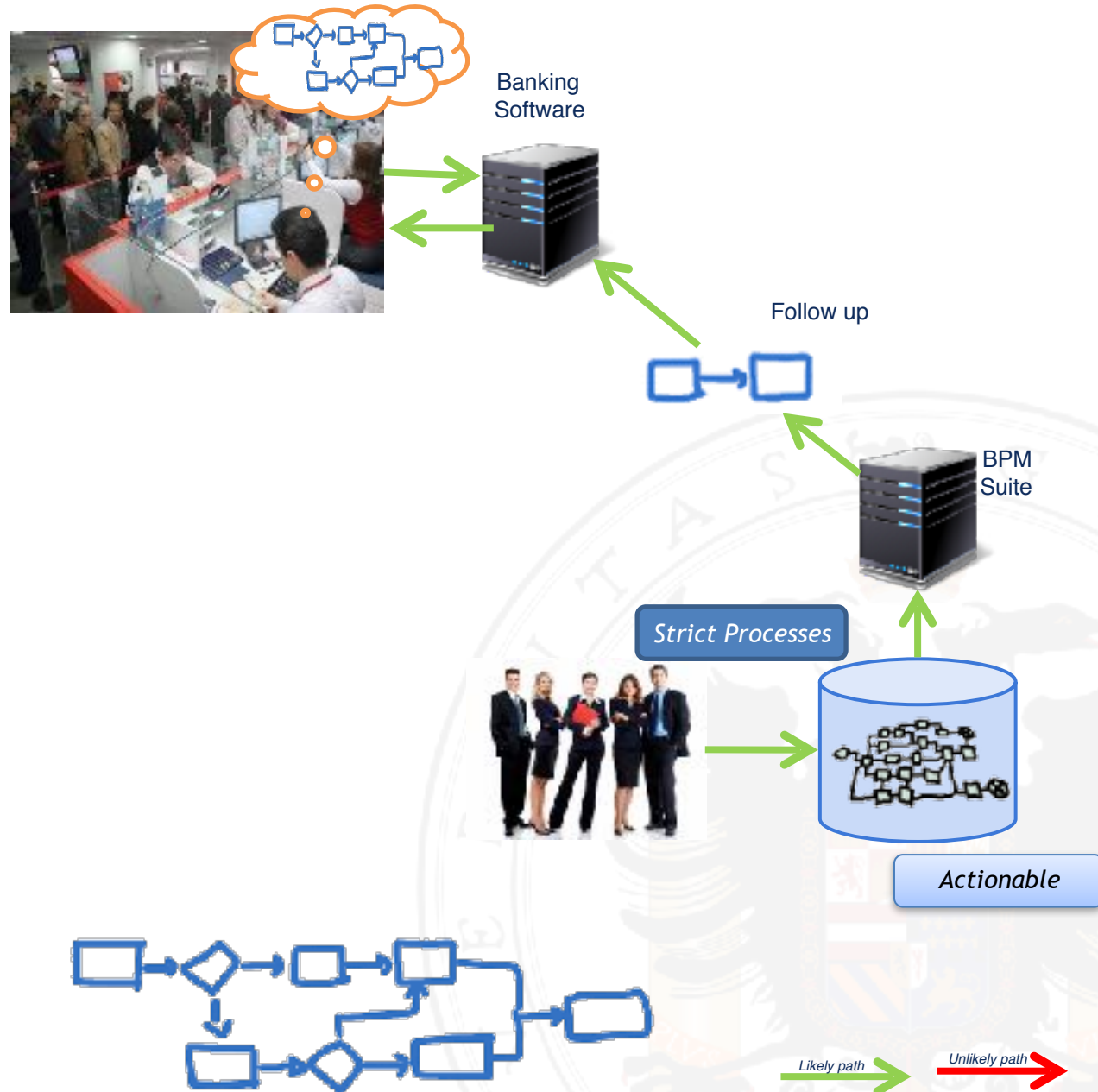


Likely path

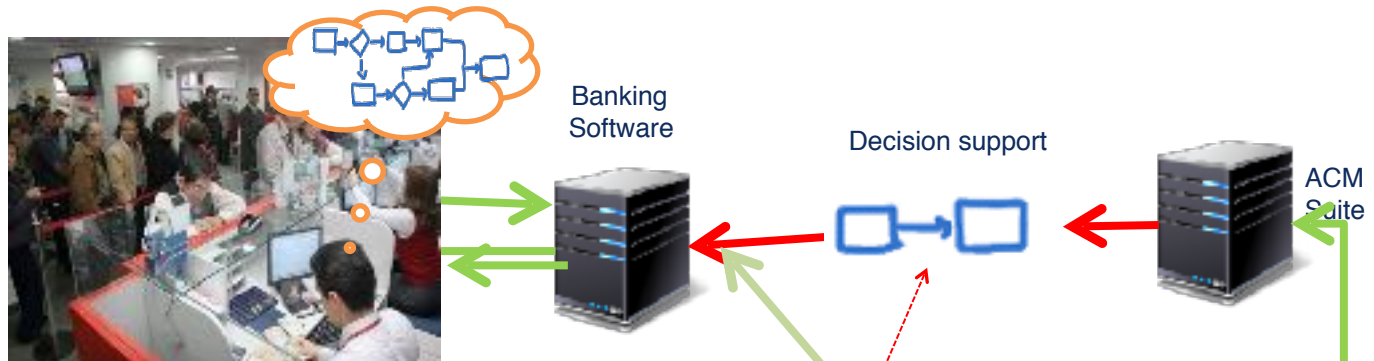
Unlikely path



Fixed Environment
Predictable behaviour



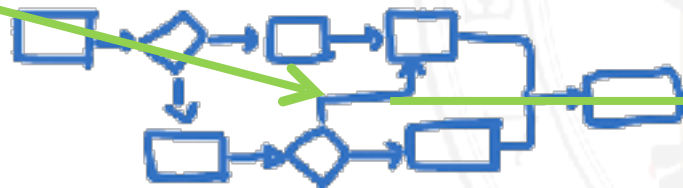
Fixed Environment
Predictable behaviour



**We do not need to discover the process:
we already knew it beforehand!**

Another event log: order handling

order_id	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:25:05	Anna Jones	iPhone4S	1
0001	register order	22-1-2014 09:25:10	Anna Jones	iPhone4S	2
0001	register order	22-1-2014 09:25:20	Anna Jones	iPhone4S	1
0001	check stock	22-1-2014 09:25:30	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:25:35	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:25:40	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:25:45	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:25:50	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:25:55	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:00	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:05	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:10	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:15	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:20	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:25	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:30	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:35	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:40	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:45	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:50	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:26:55	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:00	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:05	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:10	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:15	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:20	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:25	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:30	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:35	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:40	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:45	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:50	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:27:55	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:00	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:05	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:10	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:15	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:20	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:25	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:30	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:35	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:40	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:45	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:50	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:28:55	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:00	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:05	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:10	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:15	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:20	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:25	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:30	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:35	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:40	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:45	Pete East	iPhone4S	1
0001	check stock	22-1-2014 09:29:50	Pete East	iPhone4S	1
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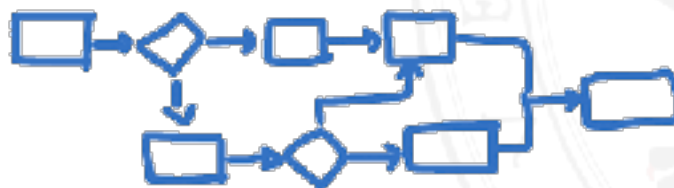
Dynamic
Environment
*Unpredictable
Behaviour*



Context



Emergency
management



Likely path → Unlikely path →

Dynamic Environment
Unpredictable Behaviour



Context



Emergency management



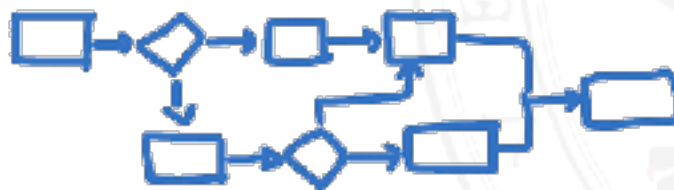
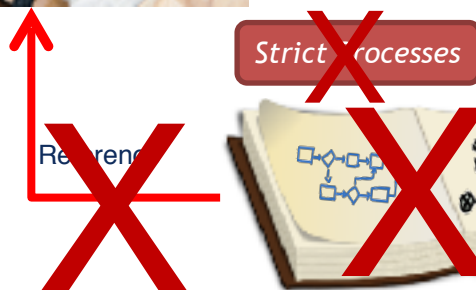
Dynamic Environment
Unpredictable Behaviour



Context



Emergency management



Dynamic Environment
Unpredictable Behaviour



Context



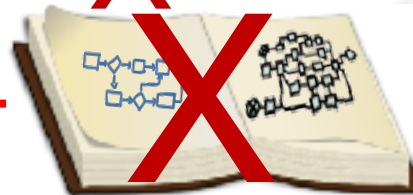
Emergency management



Follow up

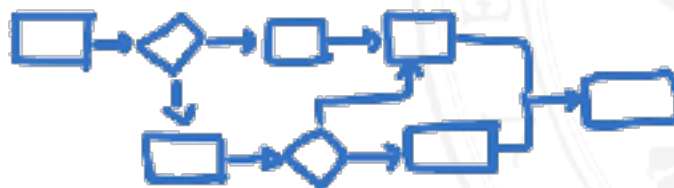
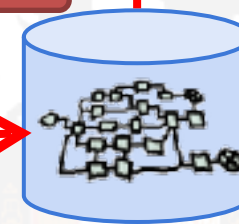


~~Strict processes~~



BPM Suite

~~Strict processes~~



Dynamic Environment
Unpredictable Behaviour



Emergency management



Context



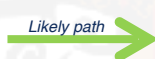
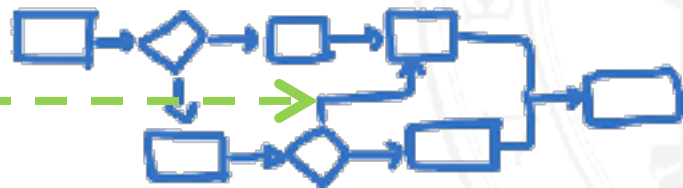
Another event log: order handling

order_id	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:15	Anna Jones	iPhone6S	1
0001	register order	22-1-2014 09:16	Anna Jones	iPhone6S	2
0001	register order	22-1-2014 09:20	Anna Jones	iPhone6S	1
0001	check stock	22-1-2014 09:40	Pete East	iPhone6S	1
0001	check stock	22-1-2014 09:45	Pete East	iPhone6S	1
0001	check stock	22-1-2014 09:50	Pete East	iPhone6S	1
0001	check stock	22-1-2014 09:55	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:00	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:05	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:10	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:15	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:20	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:25	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:30	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:35	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:40	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:45	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:50	Pete East	iPhone6S	1
0001	check stock	22-1-2014 10:55	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:00	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:05	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:10	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:15	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:20	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:25	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:30	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:35	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:40	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:45	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:50	Pete East	iPhone6S	1
0001	check stock	22-1-2014 11:55	Pete East	iPhone6S	1
0001	check stock	22-1-2014 12:00	Pete East	iPhone6S	1



All logs are reliable and trustworthy

There exists an exact process (out there) which is reflected in the logs



Dynamic Environment
Unpredictable Behaviour



Context

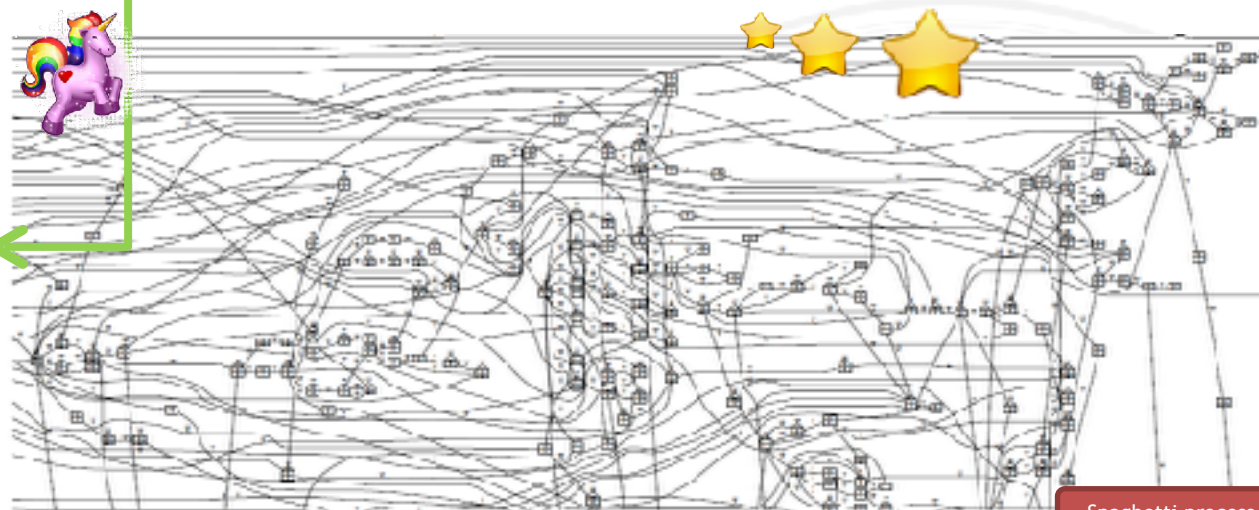


Another event log: order handling

order_id	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:25:05	Anna Jones	#P000015	1
0001	register order	22-1-2014 09:25:10	Anna Jones	#P000015	2
0001	register order	22-1-2014 09:25:20	Anna Jones	#P000015	1
0001	check stock	22-1-2014 09:25:40	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:25:45	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:25:50	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:25:55	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:00	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:05	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:10	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:15	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:20	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:25	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:30	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:35	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:40	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:45	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:50	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:26:55	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:00	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:05	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:10	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:15	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:20	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:25	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:30	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:35	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:40	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:45	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:50	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:27:55	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:00	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:05	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:10	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:15	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:20	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:25	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:30	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:35	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:40	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:45	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:50	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:28:55	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:00	Pete Best	#P000015	1
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0001	check stock	22-1-2014 09:29:10	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:15	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:20	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:25	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:30	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:35	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:40	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:45	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:50	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:29:55	Pete Best	#P000015	1
0001	check stock	22-1-2014 09:30:00	Pete Best	#P000015	1

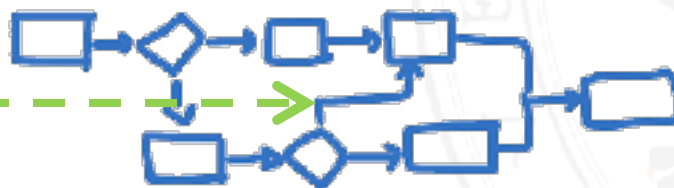


Emergency management



Spaghetti process

?



Likely path

Unlikely path

Dynamic Environment
Unpredictable Behaviour



Context



Emergency management



Another event log: order handling

order_id	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:25:05	Anna Jones	iPhone4S	1
0001	register order	22-1-2014 09:24:10	Tony Jones	iPhone4S	2
0001	register order	22-1-2014 09:20:28	Brian Jones	iPhone4S	1
0001	check stock	22-1-2014 09:20:40	Pete East	iPhone4S	1
0001	check order	22-1-2014 09:20:18	Don Fox	iPhone4S	1
0001	cancel order	22-1-2014 09:15:10	John Fox	iPhone4S	1
0001	handle payment	22-1-2014 09:10:05	Caroline	iPhone4S	1
0002	check stock	22-1-2014 09:10:17	Pete East	iPhone4S	2
0002	cancel order	22-1-2014 09:10:30	Caroline	iPhone4S	2

+ process
- context

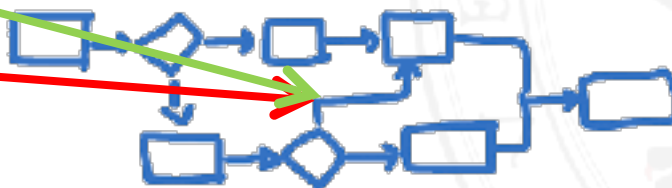
Process miner

Explore



Planning Learner

+ context
- process



Likely path

Unlikely path



Dynamic Environment
Unpredictable Behaviour



Context



Emergency management



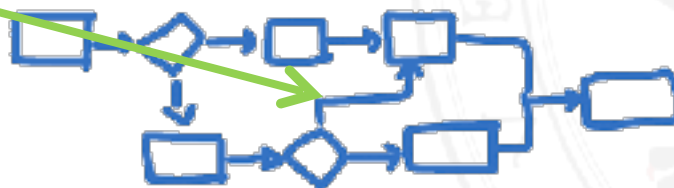
Another event log: order handling

order number	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:25:05	Anna Jones	iPhone4S	1
0001	register order	22-1-2014 09:24:10	Tony Jones	iPhone4S	2
0001	register order	22-1-2014 09:20:28	Brian Jones	iPhone4S	1
0001	check stock	22-1-2014 09:20:40	Pete East	iPhone4S	1
0001	allocate	22-1-2014 09:20:18	Don Fox	iPhone4S	1
0001	cancel order	22-1-2014 09:21:10	Don Fox	iPhone4S	1
0001	handle payment	22-1-2014 09:20:08	Caroline	iPhone4S	1
0002	check stock	22-1-2014 09:20:27	Pete East	iPhone4S	2
0002	cancel order	22-1-2014 09:20:30	Caroline	iPhone4S	2

+ process
- context

Process miner

Explore



Likely path

Unlikely path



Dynamic Environment
Unpredictable Behaviour



Context



Another event log: order handling

order_id	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:15	Anna Jones	iPhone4S	1
0001	register order	22-1-2014 09:16	Anna Jones	iPhone4S	2
0001	register order	22-1-2014 09:20	Anna Jones	iPhone4S	1
0001	check stock	22-1-2014 09:40	Pete Best	iPhone4S	1
0001	check stock	22-1-2014 09:45	Pete Best	iPhone4S	1
0001	check stock	22-1-2014 09:50	Pete Best	iPhone4S	1
0001	make payment	22-1-2014 10:10	Anna Jones	iPhone4S	1
0001	make payment	22-1-2014 10:15	Anna Jones	iPhone4S	1
0001	make payment	22-1-2014 10:20	Anna Jones	iPhone4S	1
0002	check stock	22-1-2014 10:30	Pete Best	iPhone4S	2
0002	check stock	22-1-2014 10:35	Pete Best	iPhone4S	2

+ process
- context
Process miner

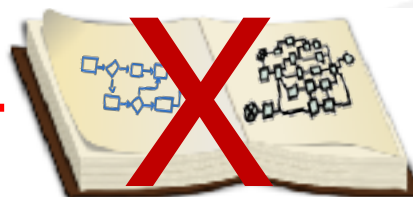
Explore



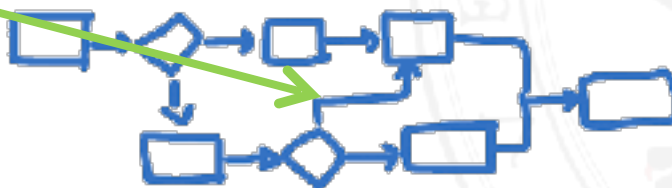
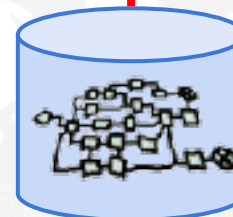
Emergency management



Reference



BPM Suite



Likely path

Unlikely path



Dynamic Environment
Unpredictable Behaviour



Context

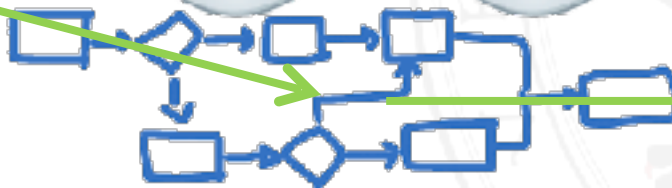


Another event log: order handling

order_id	activity	timestamp	user	product	quantity
0001	register order	22-1-2014 09:25:05	Auto Sales	iPhone4S	1
0001	register order	22-1-2014 09:24:10	Auto Sales	iPhone4S	1
0001	register order	22-1-2014 09:20:28	Auto Sales	iPhone4S	1
0001	check stock	22-1-2014 09:20:40	Pete East	iPhone4S	1
0001	check order	22-1-2014 09:20:18	Don Fox	iPhone4S	1
0001	check order	22-1-2014 09:19:16	Don Fox	iPhone4S	1
0001	handle payment	22-1-2014 09:19:08	CardPoint	iPhone4S	1
0002	check stock	22-1-2014 09:19:17	Pete East	iPhone4S	2
0002	cancel order	22-1-2014 09:18:30	CardPoint	iPhone4S	2

+ process
- context
Process miner

Explore



Likely path

Unlikely path

Context

Emergency management



Decision support



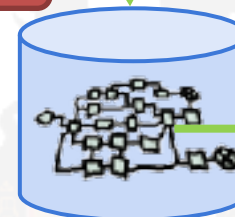
IActiveKnowledgeStudio

Refined Processes

ACM Suite



Loose Processes



Actionable

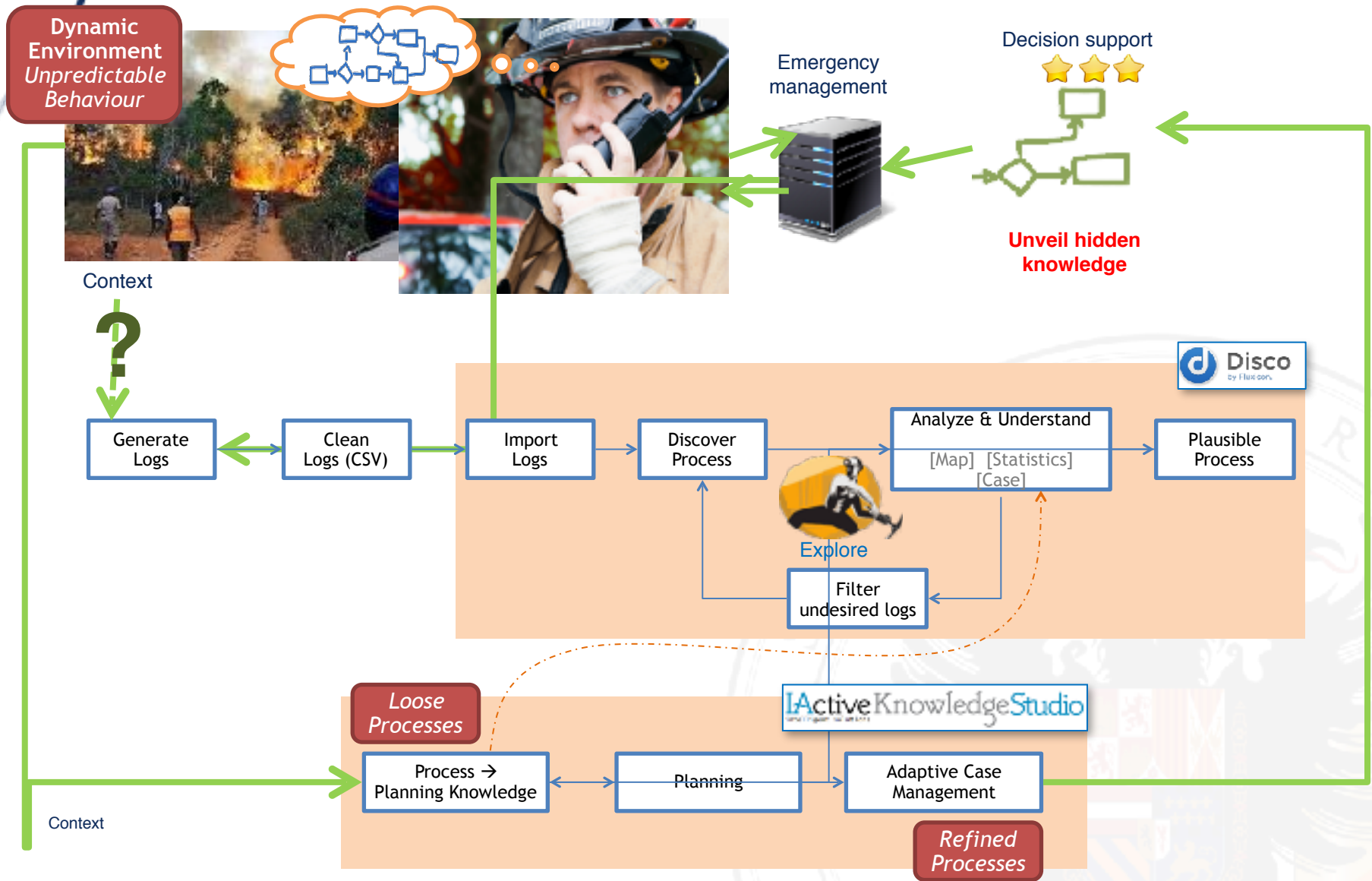
Case Management Platform

Enabling Continuous Improvement

Empowerment of Case Participants

Effective Availability of Information

Adaptability in Case Execution



- **Introduction to DISCO**
 - **Flexible**
 - **Fast**
 - **Easy to use**
 - **ProM**

vs

DISCO



Maria Abigail Manalastas, "Process Mining for Intelligent Planning and Scheduling in Adaptive Case Management Environments", UGR, 2012

Healthcare process logs in two hospitals with pediatric oncology units



• Introduction to DISCO

- Flexible
- Fast
- Easy to use

• ProM

Heuristic Net

vs

DISCO

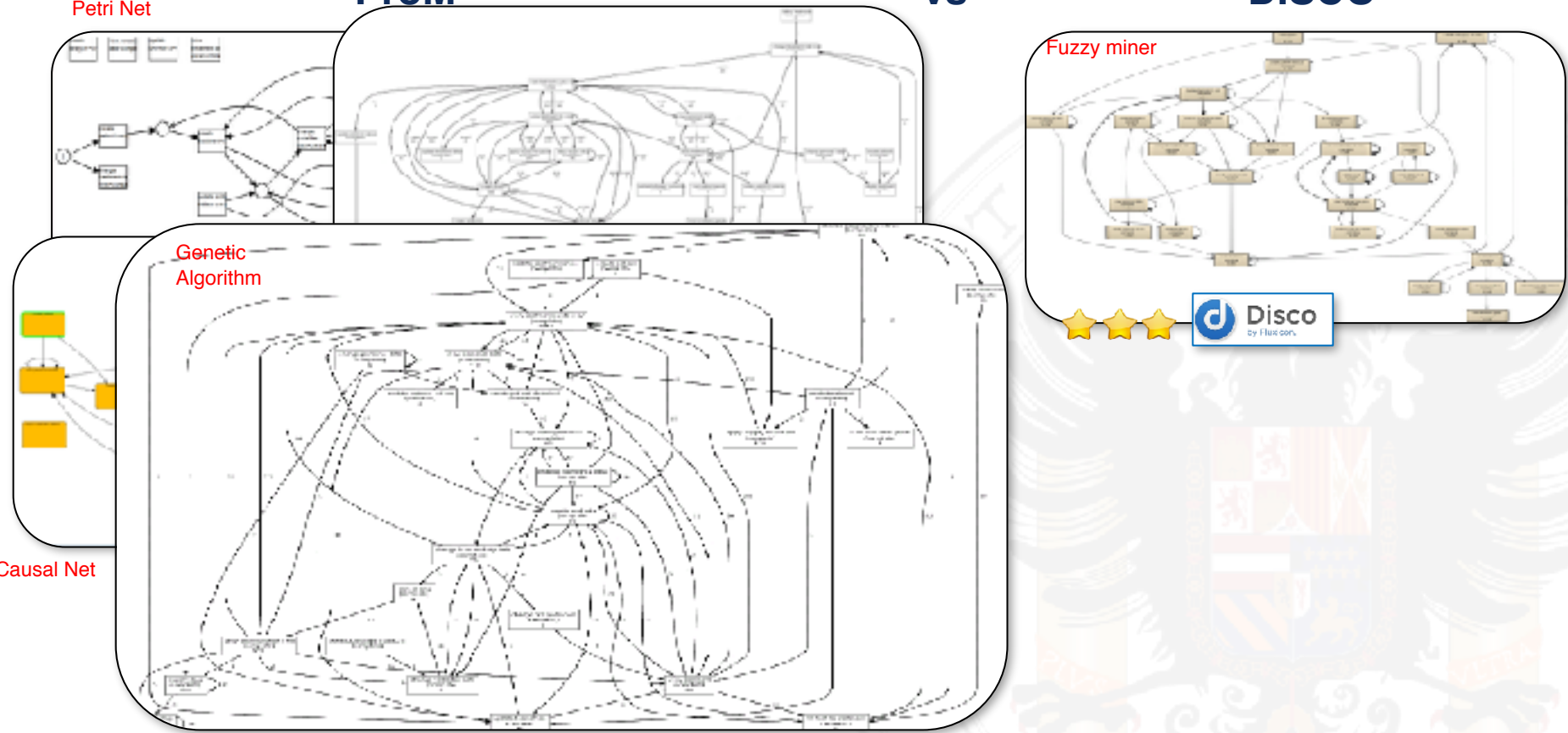
Petri Net

Genetic Algorithm

Fuzzy miner



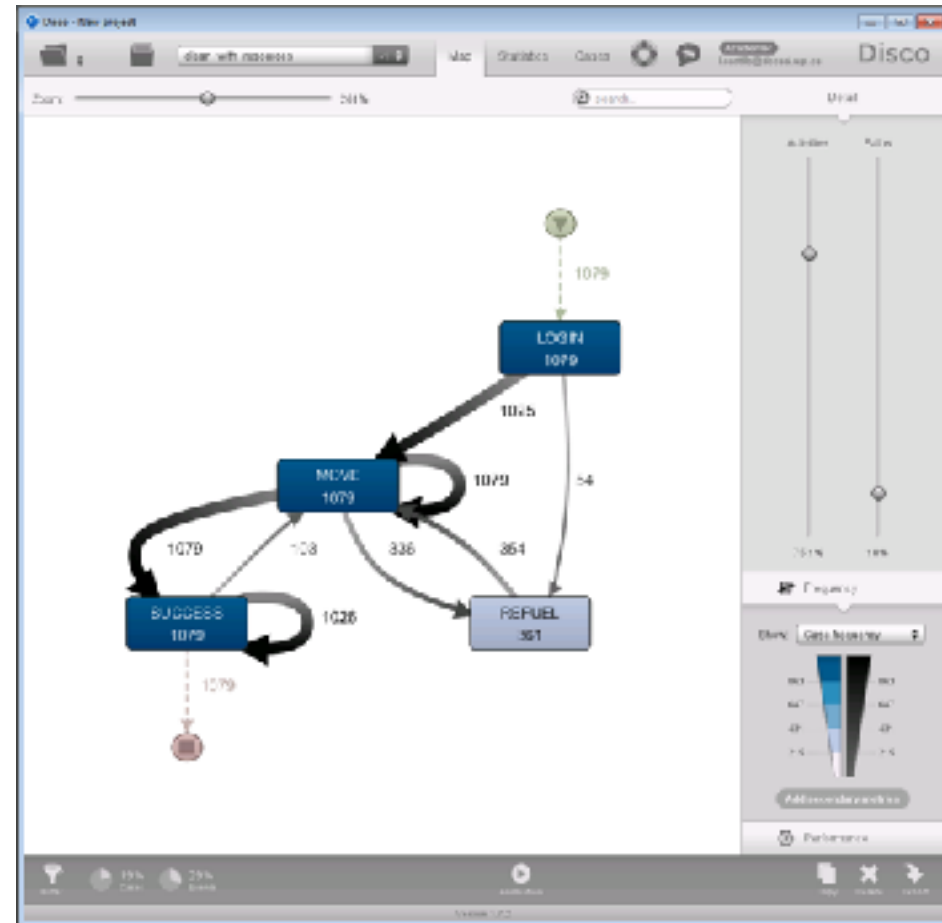
Causal Net



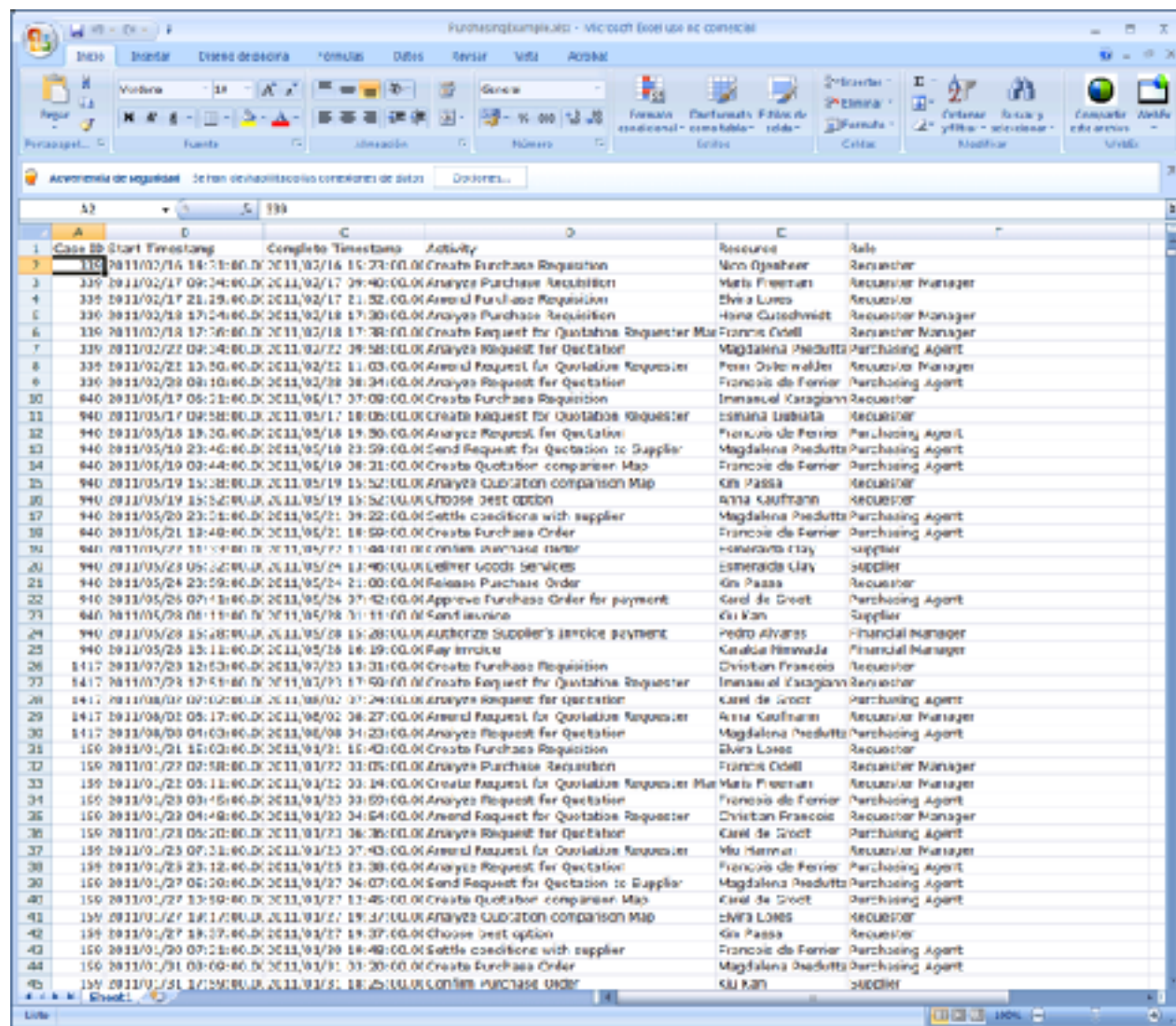
- **Introduction to DISCO**
 - Flexible
 - Fast
 - Easy to use
 - ProM vs DISCO
 - Supports full lifecycle
 - Project management
 - Import data
 - Discover process
 - Statistics and analysis
 - Powerful data filters
 - Export results

- **Links**

- <http://fluxicon.com/disco/>
- <https://fluxicon.com/disco/files/Disco-User-Guide.pdf>
- <https://fluxicon.com/disco/files/Disco-Tour.pdf>
- <https://fluxicon.com/disco/files/Fluxicon-Disco-Case-Study-Refund-Process.pdf>
- <https://fluxicon.com/disco/files/Disco-Demo-Logs.zip>



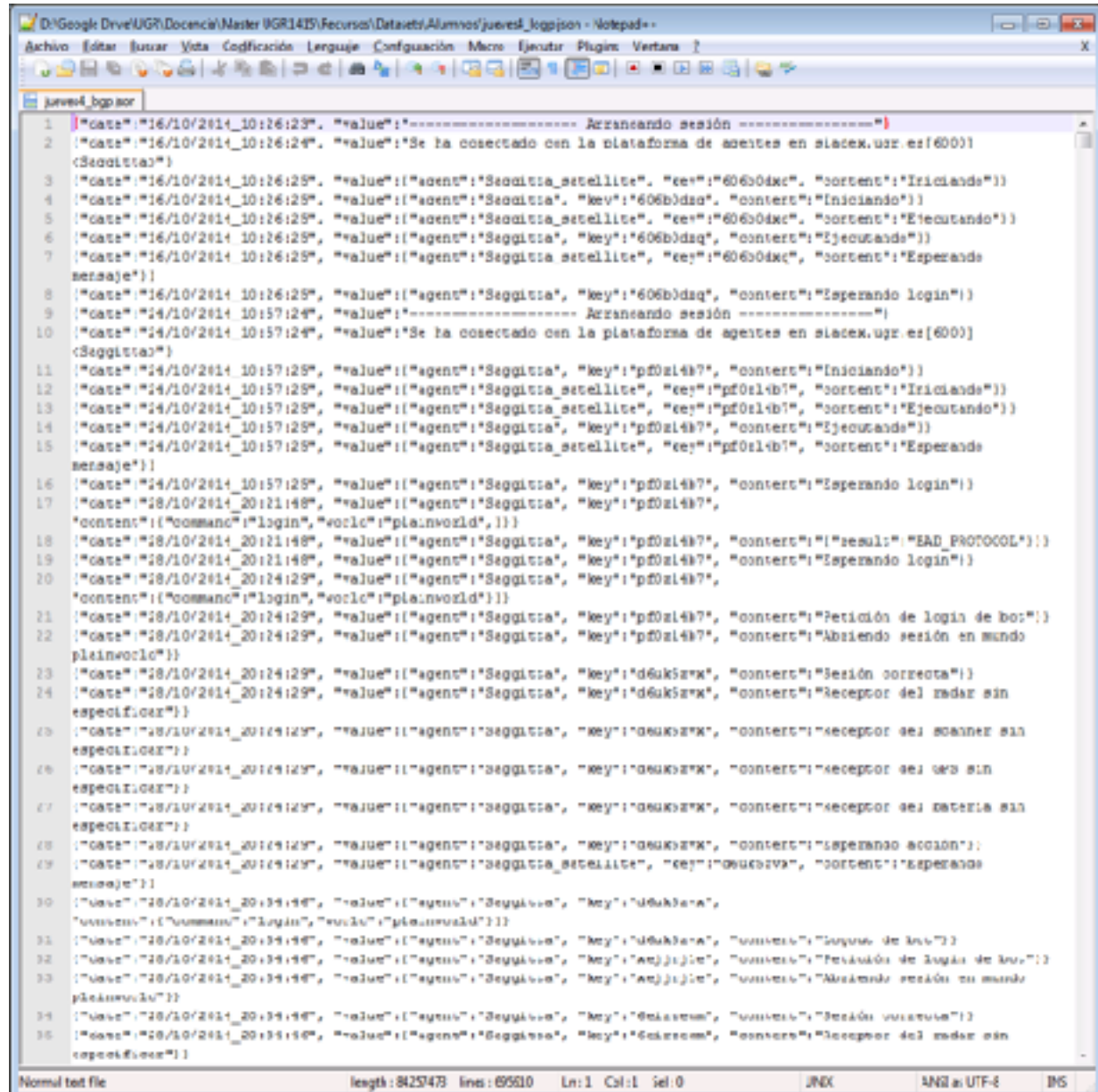
- Dealing with logs
 - Purchase log
 - DBA1516 log



	A	B	C	D	E	F
	Case ID	Start Timestamp	Complete Timestamp	Activity	Resource	Role
1	110	2011/02/16 14:21:00.D	2011/02/16 15:27:00.D	Create Purchase Requisition	Nico Opsmeer	Requisitor
2	339	2011/02/17 09:34:00.D	2011/02/17 09:40:00.D	Analyze Purchase Requisition	Marta Freeman	Requisitor Manager
3	339	2011/02/17 21:29:00.D	2011/02/17 21:52:00.D	Amend Purchase Requisition	Elvis Lopes	Requisitor
4	339	2011/02/18 17:24:00.D	2011/02/18 17:30:00.D	Analyze Purchase Requisition	Hana Gutschmidt	Requisitor Manager
5	110	2011/02/18 17:36:00.D	2011/02/18 17:38:00.D	Create Request for Quotation	Francis Odell	Requisitor Manager
6	339	2011/02/22 08:34:00.D	2011/02/22 09:58:00.D	Analyze Request for Quotation	Magdalena Piedotti	Purchasing Agent
7	339	2011/02/22 13:20:00.D	2011/02/22 11:03:00.D	Amend Request for Quotation	Peter Odeh-weller	Requisitor Manager
8	339	2011/02/28 08:10:00.D	2011/02/28 08:34:00.D	Analyze Request for Quotation	Francis de Fier	Purchasing Agent
9	840	2011/03/17 06:22:00.D	2011/03/17 07:00:00.D	Create Purchase Requisition	Immanuel Karagann	Requisitor
10	940	2011/03/17 08:58:00.D	2011/03/17 10:00:00.D	Create Request for Quotation	Ismael Lumbata	Requisitor
11	940	2011/03/18 19:30:00.D	2011/03/18 19:30:00.D	Analyze Request for Quotation	Francis de Fier	Purchasing Agent
12	940	2011/03/19 23:46:00.D	2011/03/19 23:59:00.D	Send Request for Quotation to Supplier	Magdalena Piedotti	Purchasing Agent
13	940	2011/03/19 09:44:00.D	2011/03/19 09:21:00.D	Create Quotation comparison Map	Francis de Fier	Purchasing Agent
14	940	2011/03/19 15:38:00.D	2011/03/19 15:52:00.D	Analyze Quotation comparison Map	Gis Passa	Requisitor
15	940	2011/03/19 15:52:00.D	2011/03/19 15:52:00.D	Choose best option	Ana Kaufmann	Requisitor
16	940	2011/03/20 23:22:00.D	2011/03/21 09:22:00.D	Settle conditions with supplier	Magdalena Piedotti	Purchasing Agent
17	840	2011/03/21 13:48:00.D	2011/03/21 18:50:00.D	Create Purchase Order	Francis de Fier	Purchasing Agent
18	840	2011/03/27 11:00:00.D	2011/03/27 11:00:00.D	Confirm purchase order	Immanuel Karagann	Supplier
19	940	2011/03/28 09:22:00.D	2011/03/28 13:40:00.D	Deliver goods services	Immanuel Karagann	Supplier
20	940	2011/03/28 23:59:00.D	2011/03/28 21:00:00.D	Release Purchase Order	Gis Passa	Requisitor
21	940	2011/03/28 07:13:00.D	2011/03/28 07:42:00.D	Approve Purchase Order for payment	Carl de Groot	Purchasing Agent
22	840	2011/03/28 08:15:00.D	2011/03/28 10:11:00.D	Send invoice	Gu Kan	Supplier
23	940	2011/03/28 15:28:00.D	2011/03/28 15:28:00.D	Authorize Supplier's invoice payment	Peter Alvarez	Financial Manager
24	940	2011/03/28 15:11:00.D	2011/03/28 16:19:00.D	Pay invoice	Carla Almeida	Financial Manager
25	840	2011/03/28 12:03:00.D	2011/03/28 13:31:00.D	Create Purchase Requisition	Christian Francis	Requisitor
26	840	2011/03/28 17:53:00.D	2011/03/28 17:50:00.D	Create Request for Quotation	Immanuel Karagann	Requisitor
27	840	2011/03/28 07:02:00.D	2011/03/28 07:24:00.D	Analyze request for quotation	Carl de Groot	Purchasing Agent
28	840	2011/03/28 09:17:00.D	2011/03/28 09:27:00.D	Amend Request for Quotation	Ana Kaufmann	Requisitor Manager
29	840	2011/03/28 09:03:00.D	2011/03/28 09:23:00.D	Analyze Request for Quotation	Magdalena Piedotti	Purchasing Agent
30	150	2011/03/28 15:02:00.D	2011/03/28 15:43:00.D	Create Purchase Requisition	Elvis Lopes	Requisitor
31	150	2011/03/27 07:58:00.D	2011/03/27 07:05:00.D	Analyze Purchase Requisition	Francis Odell	Requisitor Manager
32	150	2011/03/27 09:11:00.D	2011/03/27 09:14:00.D	Create Request for Quotation	Marta Freeman	Requisitor Manager
33	150	2011/03/27 09:15:00.D	2011/03/27 09:09:00.D	Analyze Request for Quotation	Francis de Fier	Purchasing Agent
34	150	2011/03/27 09:40:00.D	2011/03/27 09:54:00.D	Amend Request for Quotation	Christian Francis	Requisitor Manager
35	150	2011/03/27 09:20:00.D	2011/03/27 09:36:00.D	Analyze Request for Quotation	Carl de Groot	Purchasing Agent
36	150	2011/03/27 07:31:00.D	2011/03/27 07:43:00.D	Amend Request for Quotation	Marta Freeman	Requisitor Manager
37	150	2011/03/27 07:12:00.D	2011/03/27 07:30:00.D	Analyze Request for Quotation	Francis de Fier	Purchasing Agent
38	150	2011/03/27 06:20:00.D	2011/03/27 06:07:00.D	Send Request for Quotation to Supplier	Magdalena Piedotti	Purchasing Agent
39	150	2011/03/27 13:30:00.D	2011/03/27 13:45:00.D	Create Quotation comparison Map	Carl de Groot	Purchasing Agent
40	150	2011/03/27 14:11:00.D	2011/03/27 14:17:00.D	Analyze Quotation comparison Map	Elvis Lopes	Requisitor
41	150	2011/03/27 14:37:00.D	2011/03/27 14:37:00.D	Choose best option	Gis Passa	Requisitor
42	150	2011/03/28 07:21:00.D	2011/03/28 08:40:00.D	Settle conditions with supplier	Francis de Fier	Purchasing Agent
43	150	2011/03/28 09:09:00.D	2011/03/28 09:20:00.D	Create Purchase Order	Magdalena Piedotti	Purchasing Agent
44	150	2011/03/28 14:39:00.D	2011/03/28 14:39:00.D	Confirm purchase order	Gu Kan	Supplier

- Dealing with logs
 - Purchase log
 - DBA1516 log

• Lots of information about the context
 • Additional events (granularity?)
 • Heterogeneous formats (JSON)

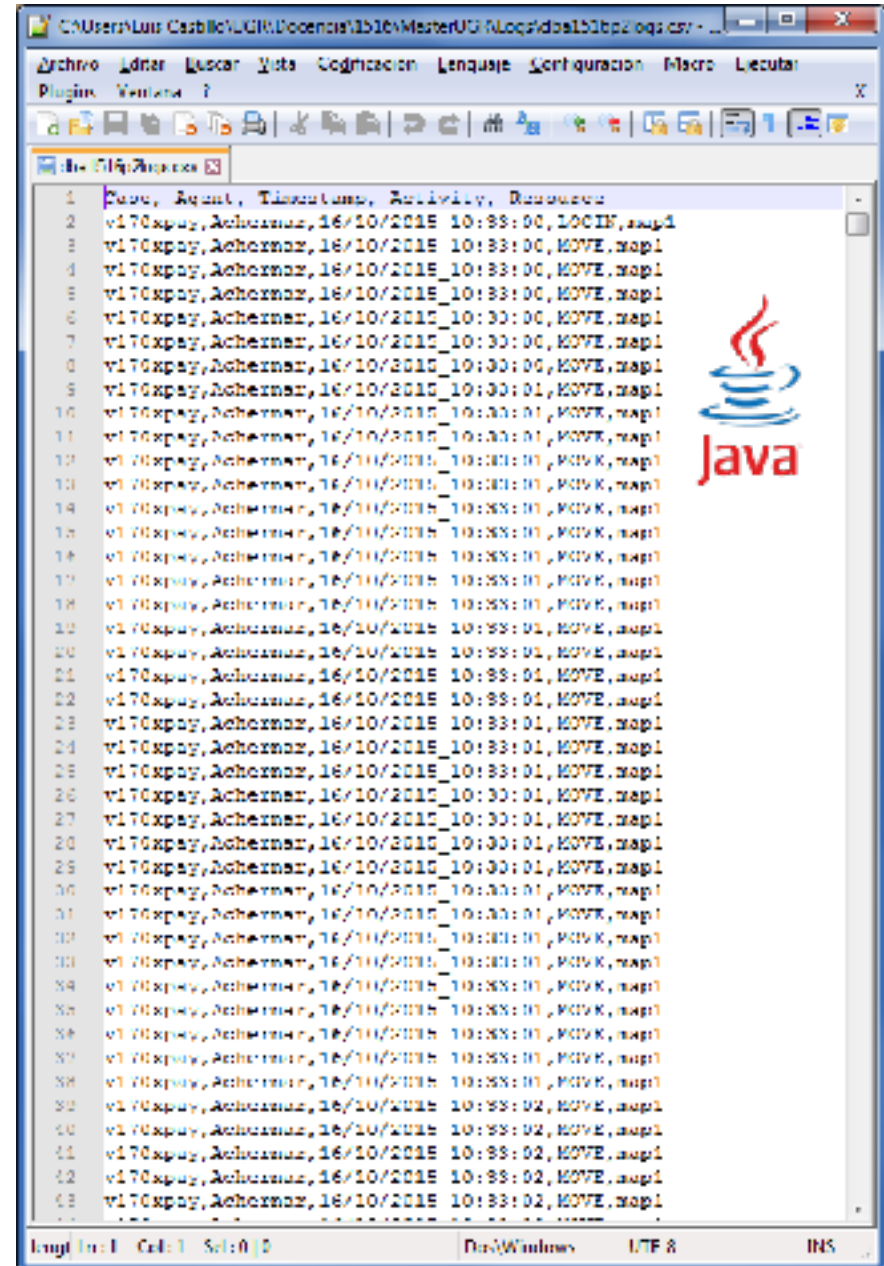


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34 [{"date": "16/10/2014_10:16:25", "value": "agent:Saggiitta", "key": "pf0z14b7", "context": "Esperando login"}]
35 [{"date": "16/10/2014_10:16:25", "value": "agent:Saggiitta", "key": "pf0z14b7", "context": "Iniciando"}]
  
```

- Dealing with logs
 - Purchase log
 - DBA1516 log

- Filtered log
- Only minimal information
- Processed with Java
- CSV

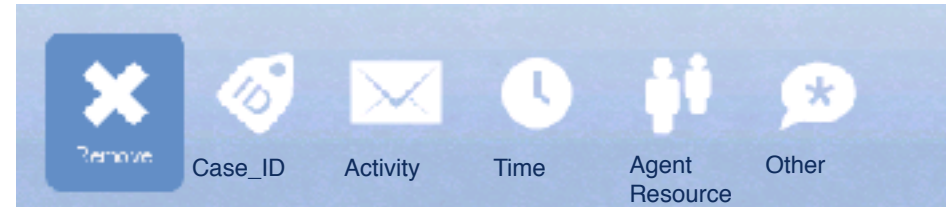


```

1 Case, Agent, Timestamp, Activity, Resource
2 vi70xpay,Achernar,16/10/2015 10:33:00,LOCIN,map1
3 vi70xpay,Achernar,16/10/2015 10:33:00,MOVE,map1
4 vi70xpay,Achernar,16/10/2015 10:33:00,MOVE,map1
5 vi70xpay,Achernar,16/10/2015 10:33:00,MOVE,map1
6 vi70xpay,Achernar,16/10/2015 10:33:00,MOVE,map1
7 vi70xpay,Achernar,16/10/2015 10:33:00,MOVE,map1
8 vi70xpay,Achernar,16/10/2015 10:33:00,MOVE,map1
9 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
10 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
11 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
12 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
13 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
14 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
15 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
16 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
17 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
18 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
19 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
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21 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
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23 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
24 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
25 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
26 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
27 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
28 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
29 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
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36 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
37 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
38 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
39 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
40 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
41 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
42 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1
43 vi70xpay,Achernar,16/10/2015 10:33:01,MOVE,map1

```


- Importing logs (CSV)
 - Identify fields
 - Not always a clear decision



Case ID

column ignored

	Case ID	Start Timestamp	Complete Timestamp	Activity	Resource	Role
1	339	2011/02/16 14:31:00.000	2011/02/16 15:23:00.000	Create Purchase Requisition	Nico Ojenber	Requester
2	339	2011/02/17 09:34:00.000	2011/02/17 09:40:00.000	Analyze Purchase Requisition	Nario Freeman	Requester Manager
3	339	2011/02/17 21:29:00.000	2011/02/17 21:52:00.000	Amend Purchase Requisition	Elvira Lotes	Requester
4	339	2011/02/18 17:28:00.000	2011/02/18 17:30:00.000	Analyze Purchase Requisition	Elvira Lotes	Requester Manager

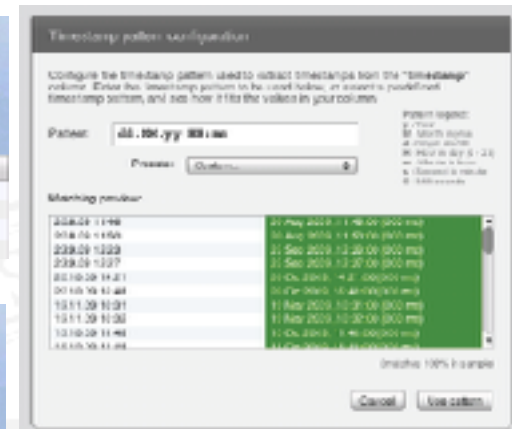
Case ID

column is used

Case

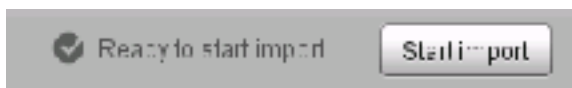
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1	339	2011/02/16 14:31:00.000	2011/02/16 15:23:00.000	Create Purchase Requisition	Nico Ojenber	Requester
2	339	2011/02/17 09:34:00.000	2011/02/17 09:40:00.000	Analyze Purchase Requisition	Nario Freeman	Requester Manager
3	339	2011/02/17 21:29:00.000	2011/02/17 21:52:00.000	Amend Purchase Requisition	Elvira Lotes	Requester
4	339	2011/02/18 17:28:00.000	2011/02/18 17:30:00.000	Analyze Purchase Requisition	Elvira Lotes	Requester Manager

Differences?



Customize date format

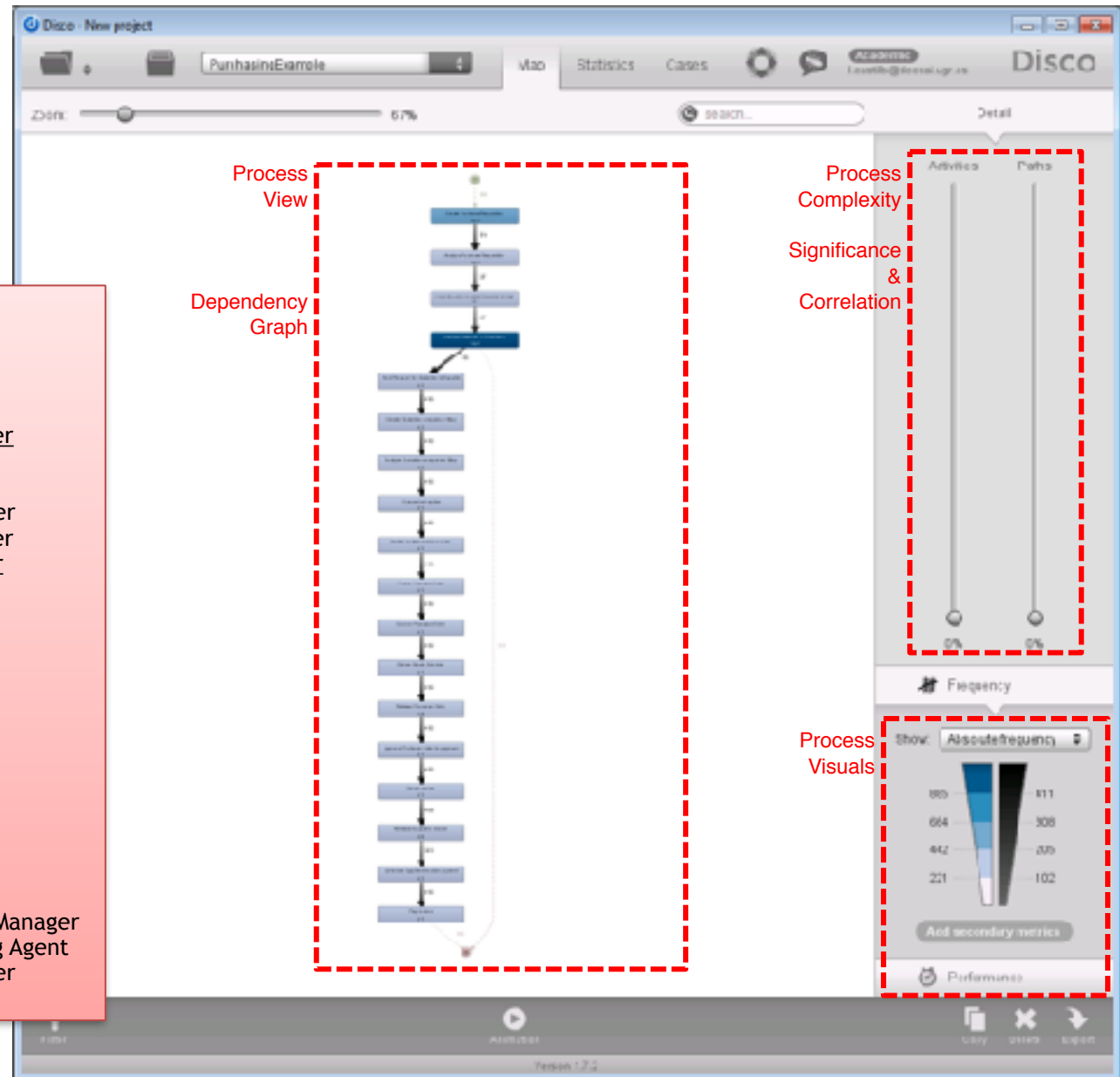
- Import



- Dealing with process maps
- Fuzzy miner

ACTIVITIES

1. Create Purchase Requisition
2. Analyze Purchase Requisition
3. Amend Purchase Requisition
4. Create Request for Quotation Requester Manager
5. Analyze Request for Quotation
6. Amend Request for Quotation Requester
7. Create Request for Quotation Requester
8. Send Request for Quotation to Supplier
9. Create Quotation comparison Map
10. Analyze Quotation comparison Map
11. Choose best option
12. Settle conditions with supplier
13. Create Purchase Order
14. Confirm Purchase Order
15. Deliver Goods Services
16. Release Purchase Order
17. Approve Purchase Order for payment
18. Send invoice
19. Authorize Supplier's Invoice payment
20. Pay invoice
21. Release Supplier's Invoice
22. Settle dispute with supplier Financial Manager
23. Settle dispute with supplier Purchasing Agent
24. Amend Request for Quotation Requester Manager



-

C:\Users\Luis Castillo\AppData\Local\Temp\Temp1\PurchasingExample_metrics.zip\Relations - Absolute Frequency.csv - Notepad++

Archivo Editar Buscar Vista Configuración Lenguaje Configuración Macro Ejecutar Plugins Ventana ? X

Relations - Absolute Frequency.csv

```

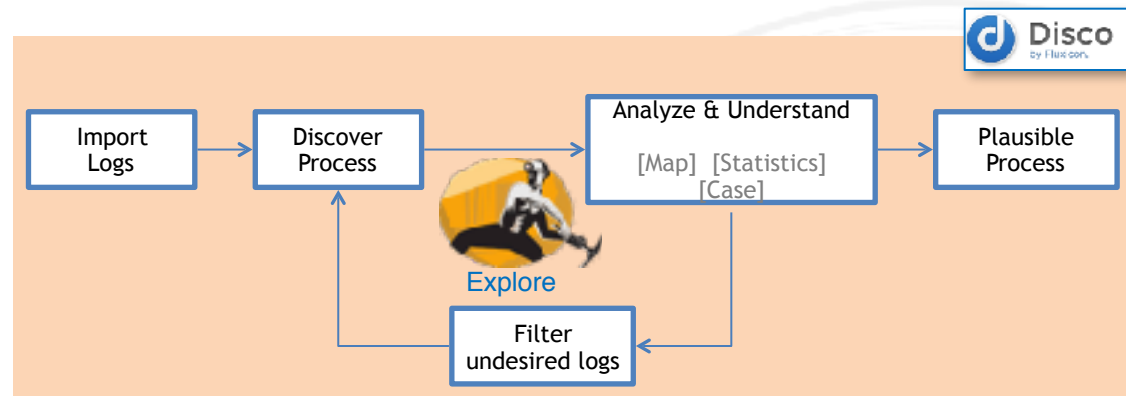
1 ,Create Purchase Requisition,Analyse Purchase Requisition,Amend Purchase Requisition,Create
Request for Quotation Requester Manager,Analyse Request for Quotation,Amend Request for
Quotation Requester,Create Request for Quotation Requester,Send Request for Quotation to
Supplier,Create Quotation comparison Map,Analyse Quotation comparison Map,Choose best
option,Settle conditions with supplier,Create Purchase Order,Confirm Purchase Order,Deliver
Goods Services,Release Purchase Order,Approve Purchase Order for payment,Send invoice,Authorize
Supplier's Invoice payment,Pay invoice,Release Supplier's Invoice,Settle dispute with supplier
Financial Manager,Settle dispute with supplier Purchasing Agent,Amend Request for Quotation
Requester Manager
2 Create Purchase Requisition,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
3 Analyse Purchase Requisition,374,0,8,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
4 Amend Purchase Requisition,0,11,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
5 Create Request for Quotation Requester Manager,0,307,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
6 Analyse Request for Quotation,0,0,0,307,0,614,197,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,49
7 Amend Request for Quotation Requester,0,0,0,0,114,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8 Create Request for Quotation Requester,234,0,3,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
9 Send Request for Quotation to Supplier,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
10 Create Quotation comparison Map,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
11 Analyse Quotation comparison Map,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
12 Choose best option,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
13 Settle conditions with supplier,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
14 Create Purchase Order,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
15 Confirm Purchase Order,0,0,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
16 Deliver Goods Services,0,0,0,0,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
17 Release Purchase Order,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
18 Approve Purchase Order for payment,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0,0,0
19 Send invoice,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0,0,0
20 Authorize Supplier's Invoice payment,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,10,0,0,323,80,0,0
21 Pay invoice,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,413,0,0,0,0,0,0,0,0
22 Release Supplier's Invoice,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,403,0,0,0,0,0,0,0
23 Settle dispute with supplier financial manager,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U,U

```

Norma text file length: 2697 lines: 26 Ln: 3 Col: 79 Sel: 0 UNEX ANSI INS

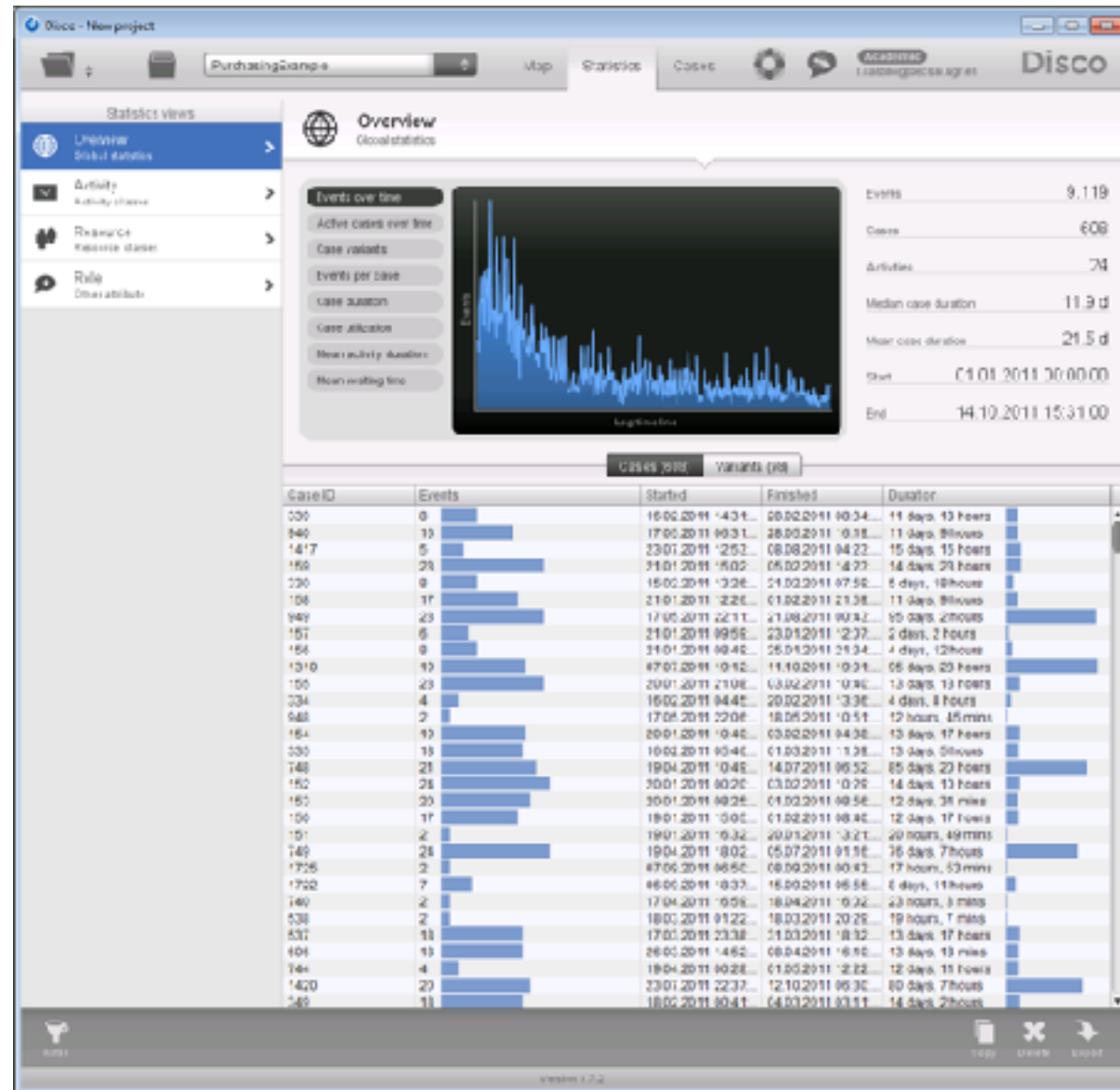
Footprint

- **Understanding the process**
- **Give a deeper view** so as to detect deviations of mainstream behaviour
- **Annotate properties of deviated processes**

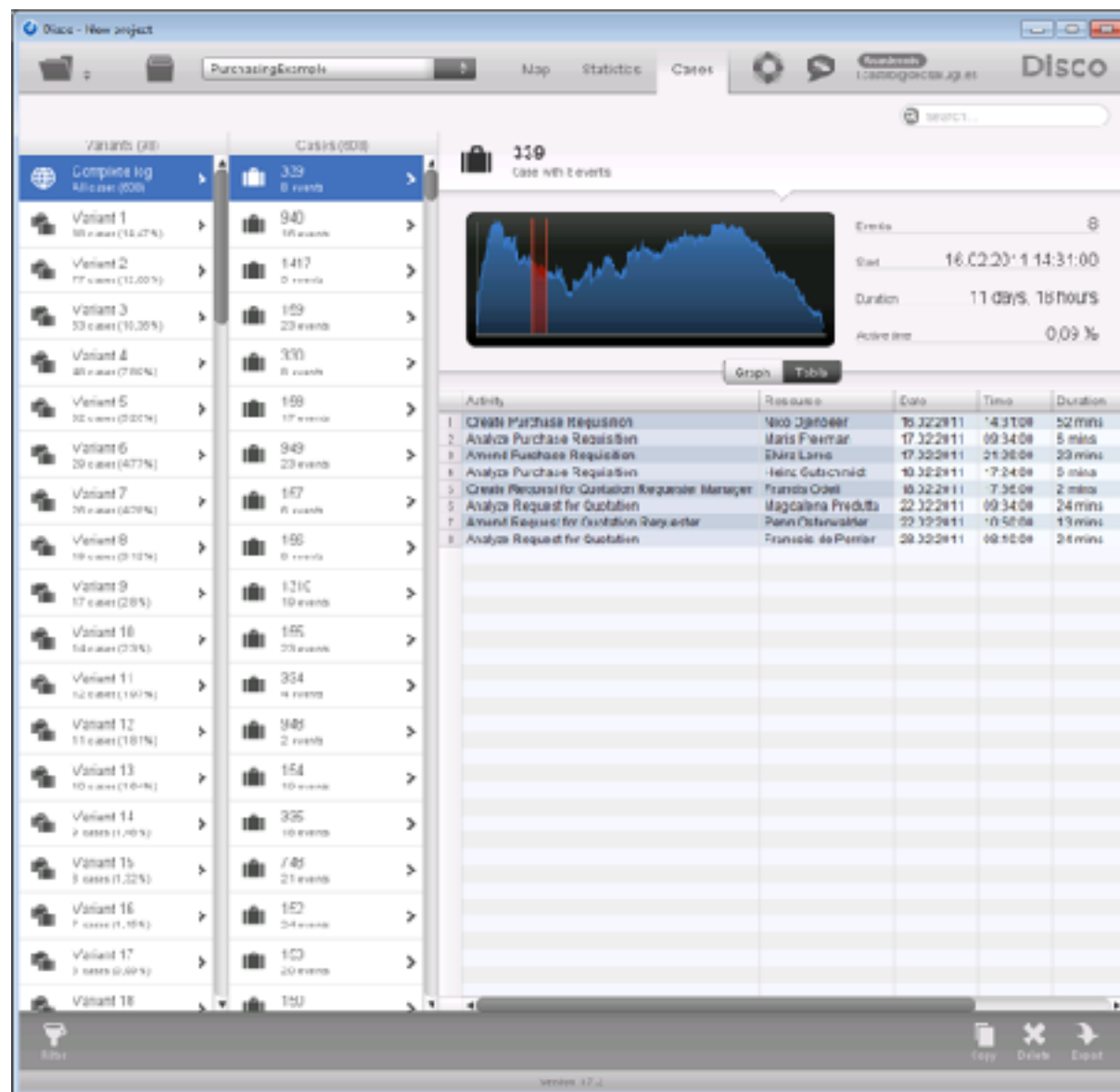


Understanding the process

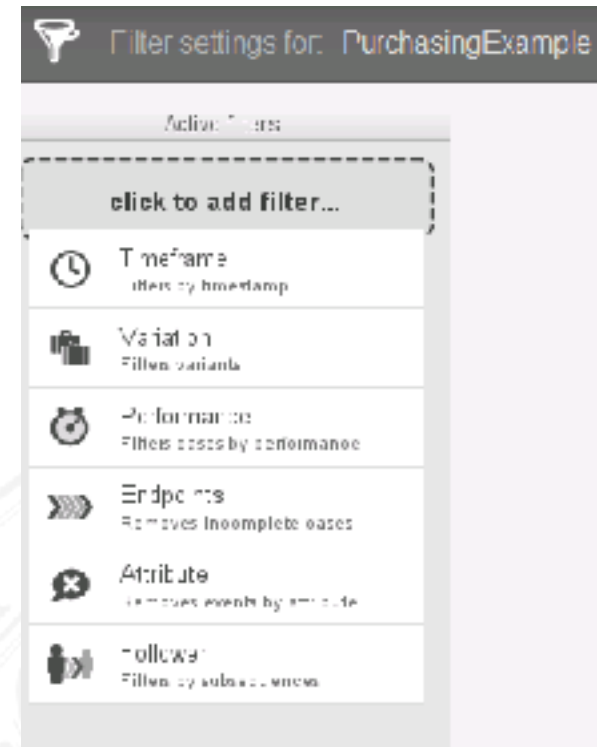
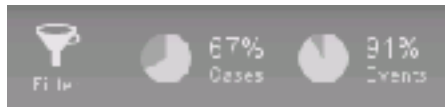
- Statistics
- Like browsing an XLS file



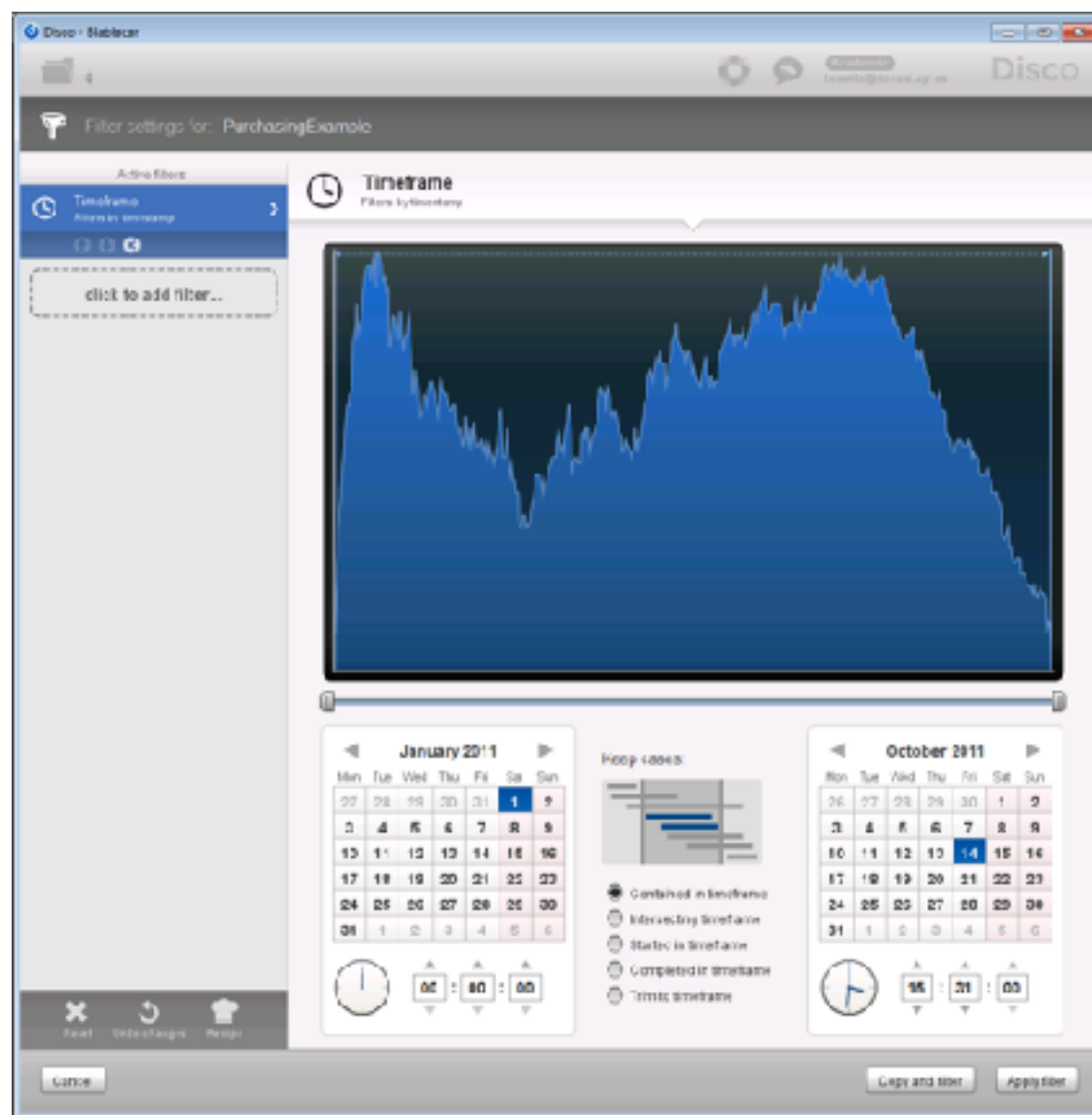
- Understanding the process
 - Case variants
 - Clusters of processes



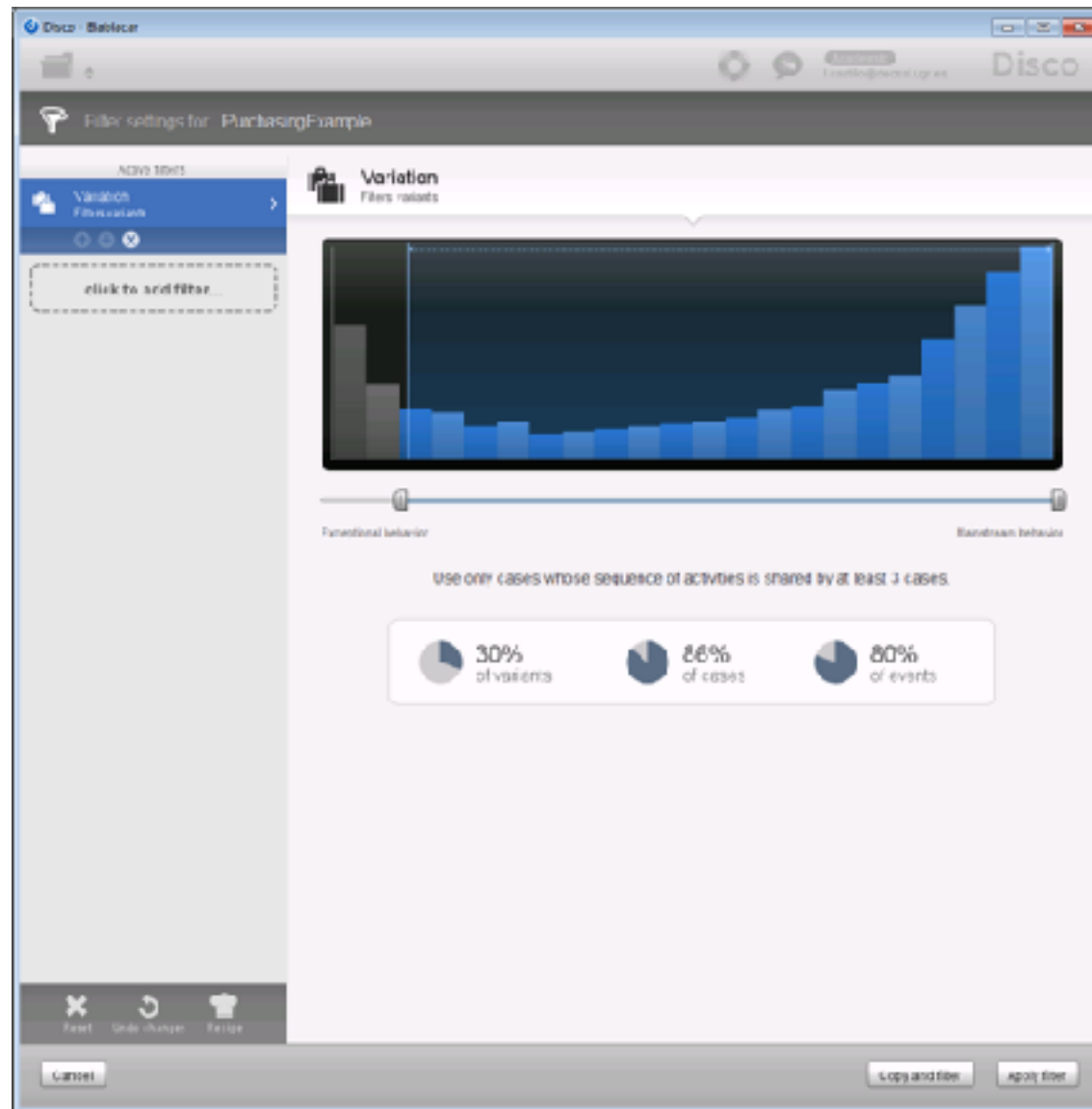
- **Filtering undesired behaviour**
 - Infrequent cases
 - Cases with errors
 - Incomplete cases
- **At each filtering step, go back to the map to check the result and the coverage**



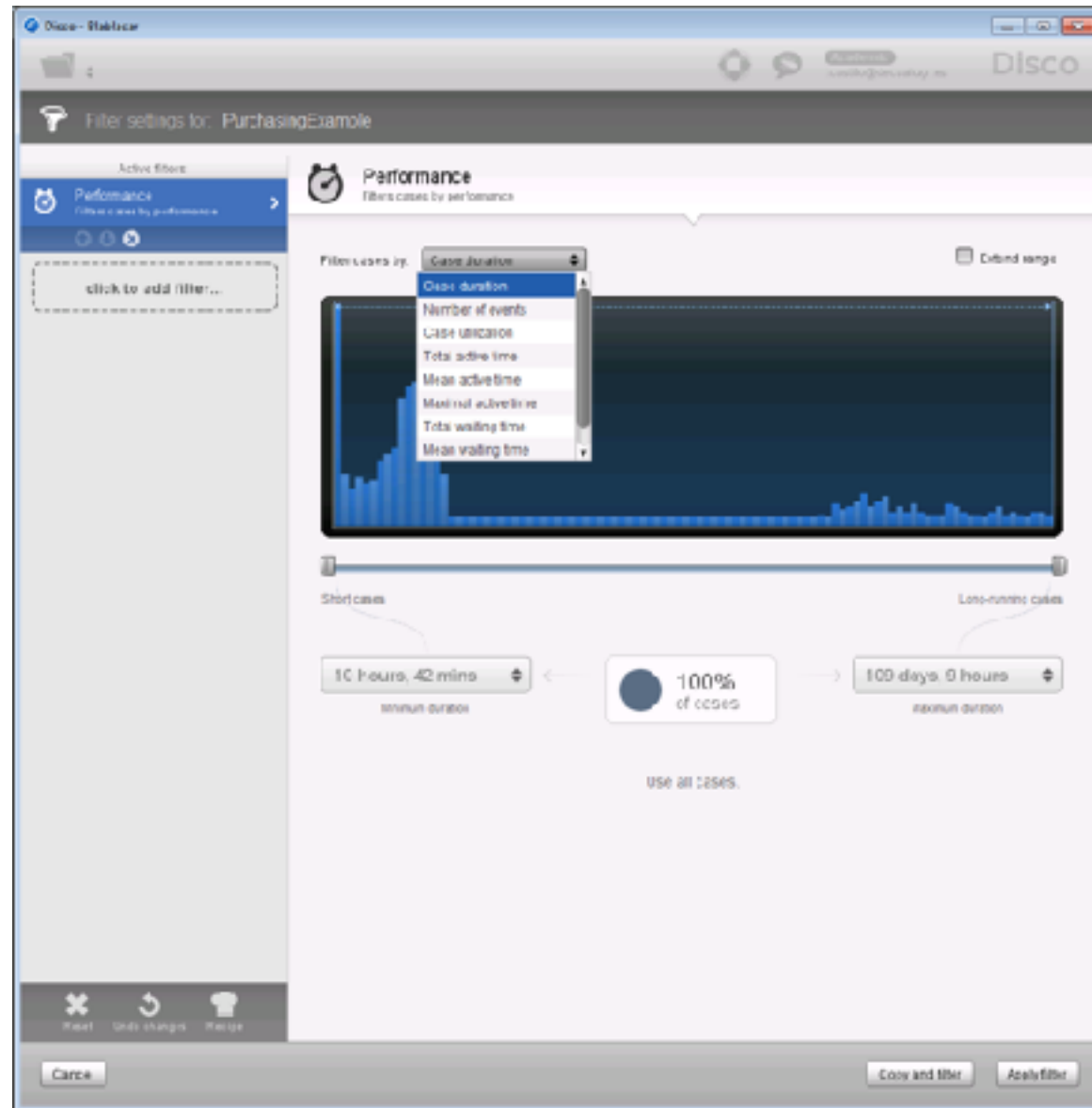
- Filtering undesired behaviour
 - Time frame



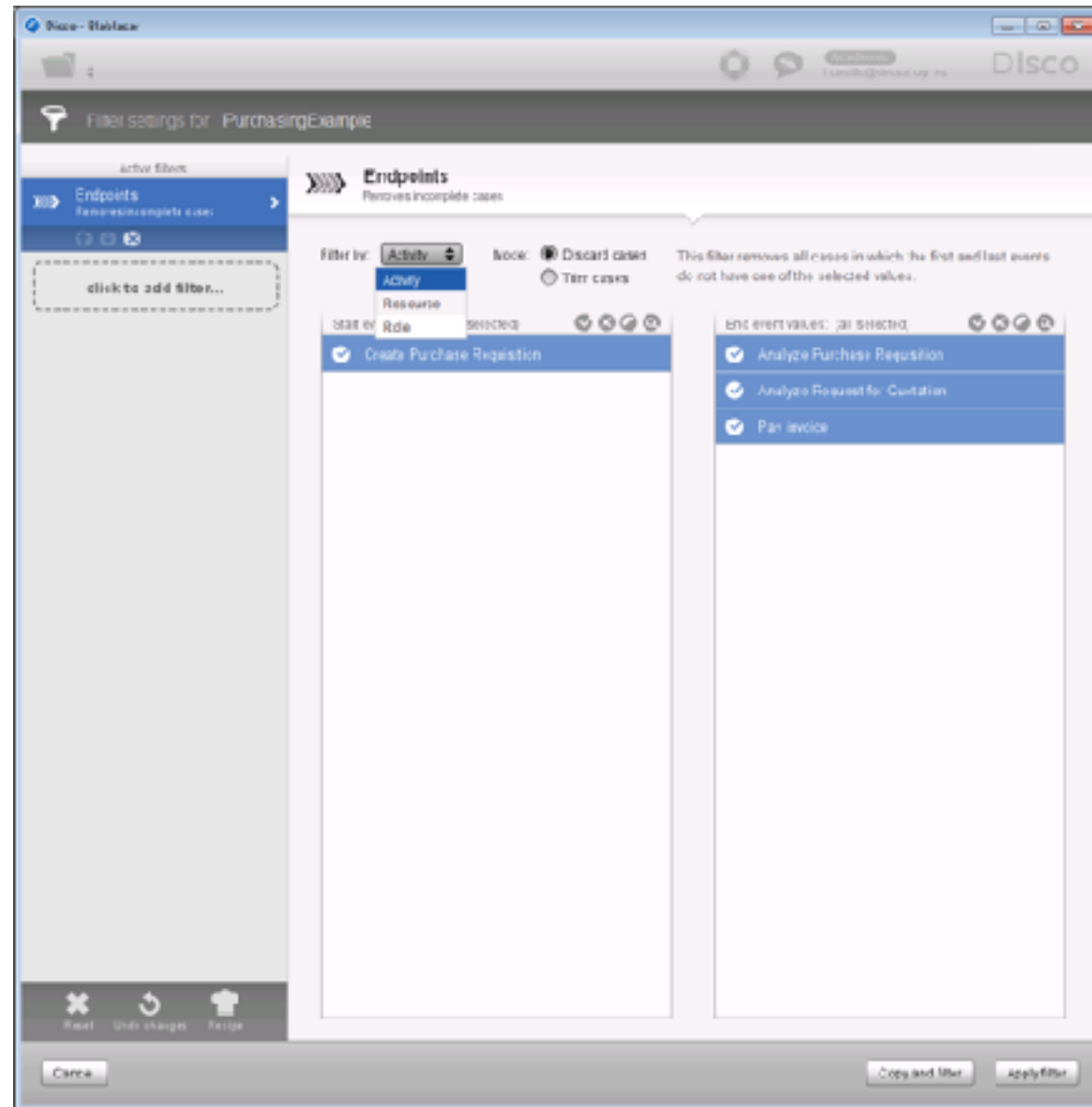
- **Filtering undesired behaviour**
 - **Variation**



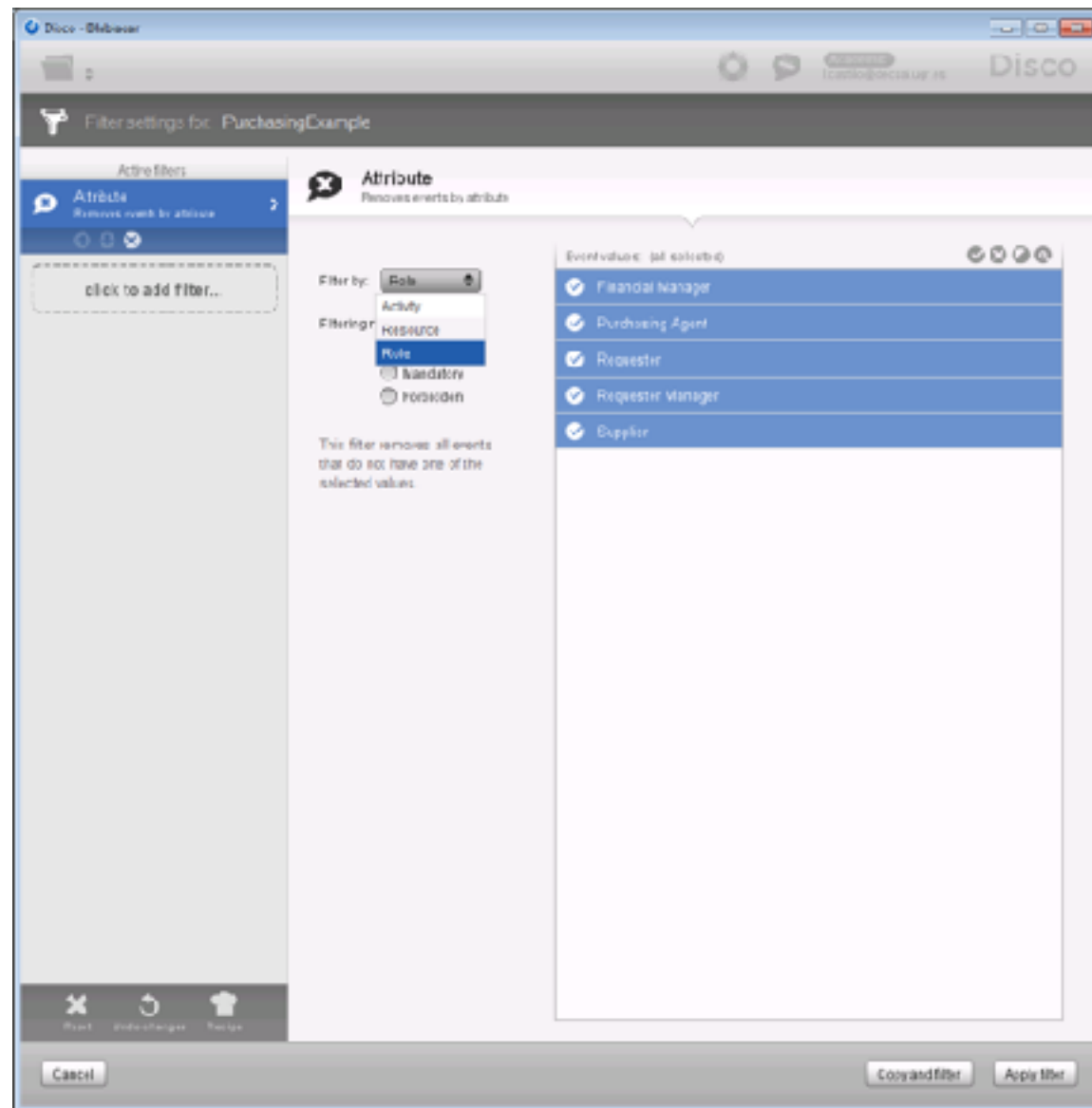
- Filtering undesired behaviour
 - Performance



- Filtering undesired behaviour
- Endpoints

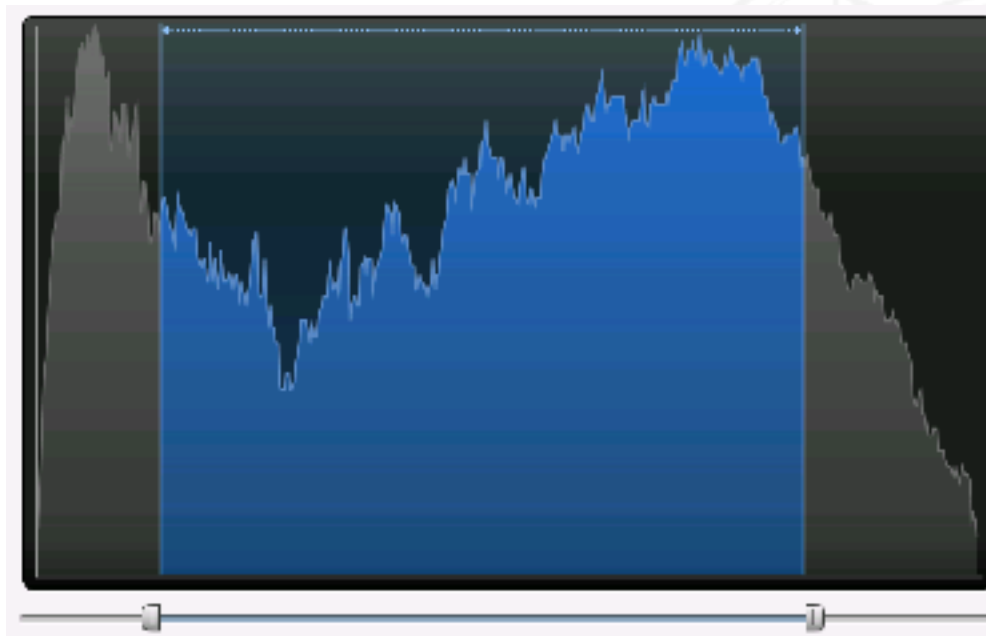


- **Filtering undesired behaviour**
 - **Attribute**



- 38

- **Filtering undesired behaviour**
 - **Bound the appropriate behavior leaving out errors, incomplete cases or simply, infrequent behaviour**
 - **Get the most plausible process model**
 - **Eventually export the model (dependency graph, fuzzy miner) to other models**



- [illegible]

Dynamic Environment
Unpredictable Behaviour



Emergency management



Decision support



Unveil hidden knowledge

Context



Generate Logs

Clean Logs (CSV)

Import Logs

Discover Process

Analyze & Understand
[Map] [Statistics] [Case]



Plausible Process

Explore



Filter undesired logs

Loose Processes

Process → Planning Knowledge

Planning

Adaptive Case Management

Refined Processes

IActive Knowledge Studio

Context



Practice work with DISCO

1. Load the log PurchasingExample
2. Use field "Role" as "Resource" and ignore field "Resource"
3. Find the most frequent process (20%-20%). Show metric "Absolute frequency". Export it to PDF as "**mfp_20_20.pdf**"
4. Find the most active Department (with highest recorded frequency)
 1. Filter out the remaining roles (leads to 89% cases and 35% events)
 2. Find its associated process (20%-20%).
 3. Show metric "Case frequency".
 4. Export it to PDF as "**pap_20_20.pdf**"
5. Load again the log PurchasingExample
6. Use field "Resource" as "Resource" and ignore field "Role"
7. Find the most frequent process (20%-20%). Show metric "Absolute frequency". Export it to PDF as "**mfp2_20_20.pdf**"
8. Find the three most active resources (with highest recorded frequency)
 1. Magdalena Predutta, Karel de Groot & Francois de Perrier
 2. What do they all have in common?
 3. Filter out their respective individual processes (30%-30%) and export it as "**mp_30_30.pdf**" "**kg_30_30.pdf**" and "**fp_30_30.pdf**" respectively and compare them.
9. Send all processes and your **comments** to the teacher **< 15/JUN/2018**

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