# Process Mining - a special type of Data Mining - to discover, check and improve your business processes

Facilitated by Arthur Valle

# Arthur Valle, PhD

- PhD in Production and System Engineering

- Lean Six Sigma Black Belt (since 2006)

- 22+ years of experience in IT Management: Lean Six Sigma, CMMI, Data Science, Agile/Scrum, ITIL etc

- Currently teaching (and researching) at Wintec-Waikato Institute of Technology, NZ

- CEO of trendsetconsulting.com (since 2000)

- In my Process Mining research, I use upflux from upflux.net, a Brazilian startup.
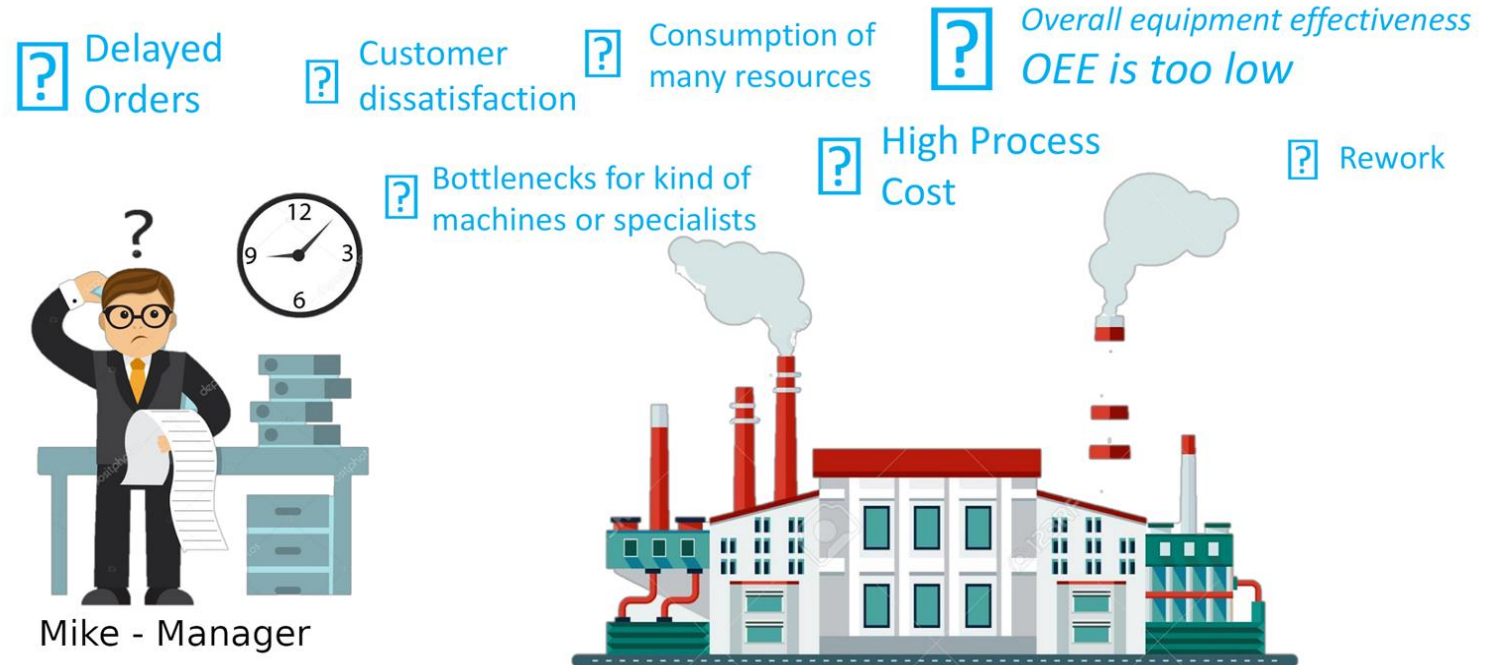
# Content

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# Everyday, problems arise in organizations...

- Are our processes <u>efficient</u>?
- <u>Where</u> are the waste, deviations and overutilization of resources?
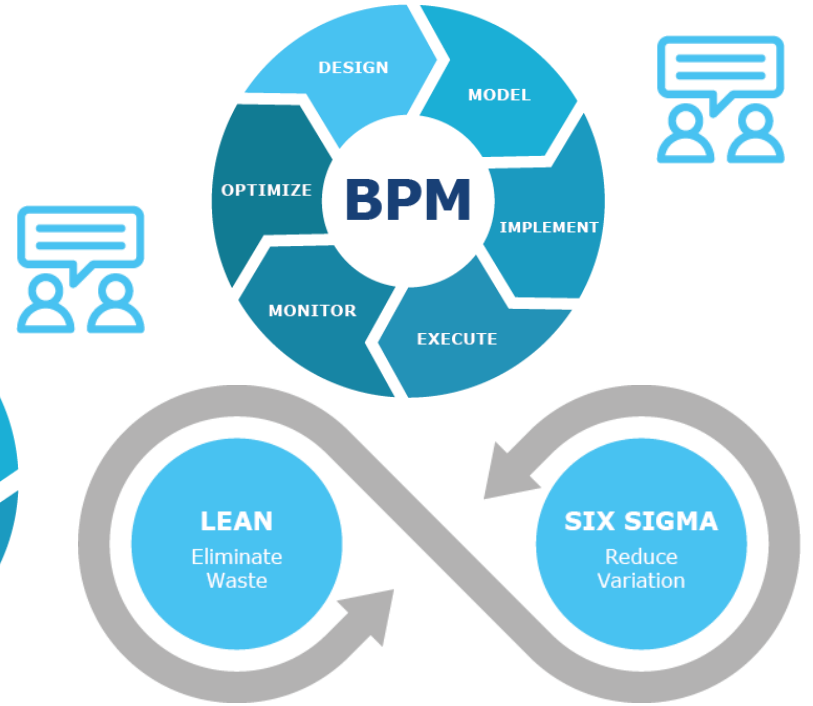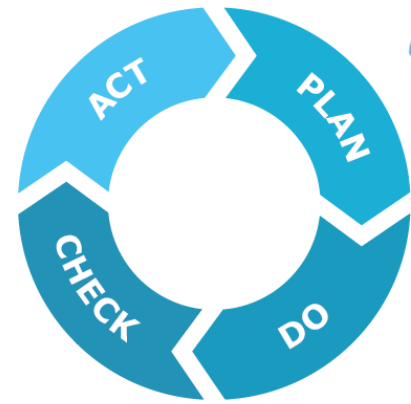
# Process improvement

- Aiming to answer such questions…<u>traditional process management techniques</u> are performed.

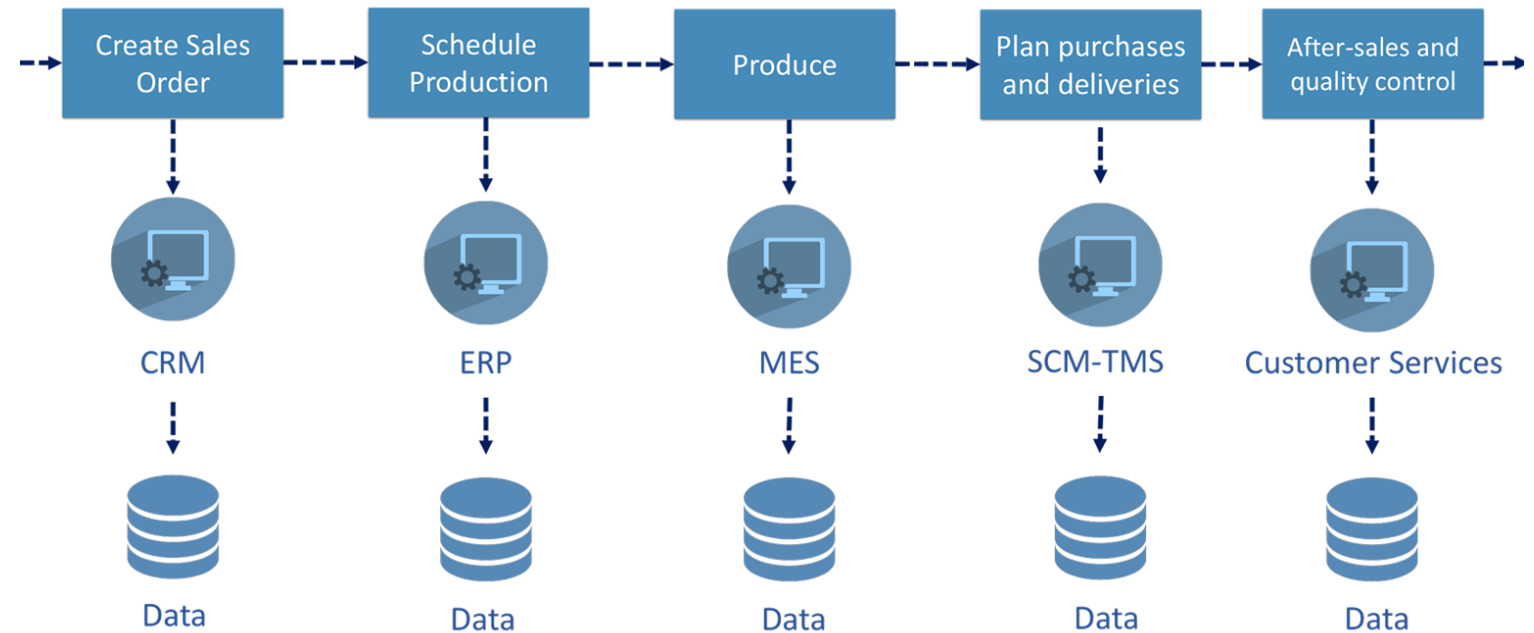# (So) many process improvement methods

# The problem is...

- In all of them, you need to manually "discover" the processes...
  - via interviews,
  - questionnaires or
  - even reading procedures (that nobody follows).

# However...in the Information Age, tons of data are stored...

# So, what if we could discover the actual processes in a matter of seconds?

# Process Mining

Process Mining - a special type of Data Mining - that:

- captures the <u>reality</u> of processes as reflected in data
- identifies <u>inefficiencies, overutilized resources or bottlenecks</u>;
- detects <u>nonconformities, deviations / frauds</u>; and
- supports <u>Continuous Improvement</u>.

# We need to have *Event logs* data:

**Who**

**Case ID**

Sales Order Number, Production Order Number...

**Who**

**Performer**

Who performed the attivity

**What**

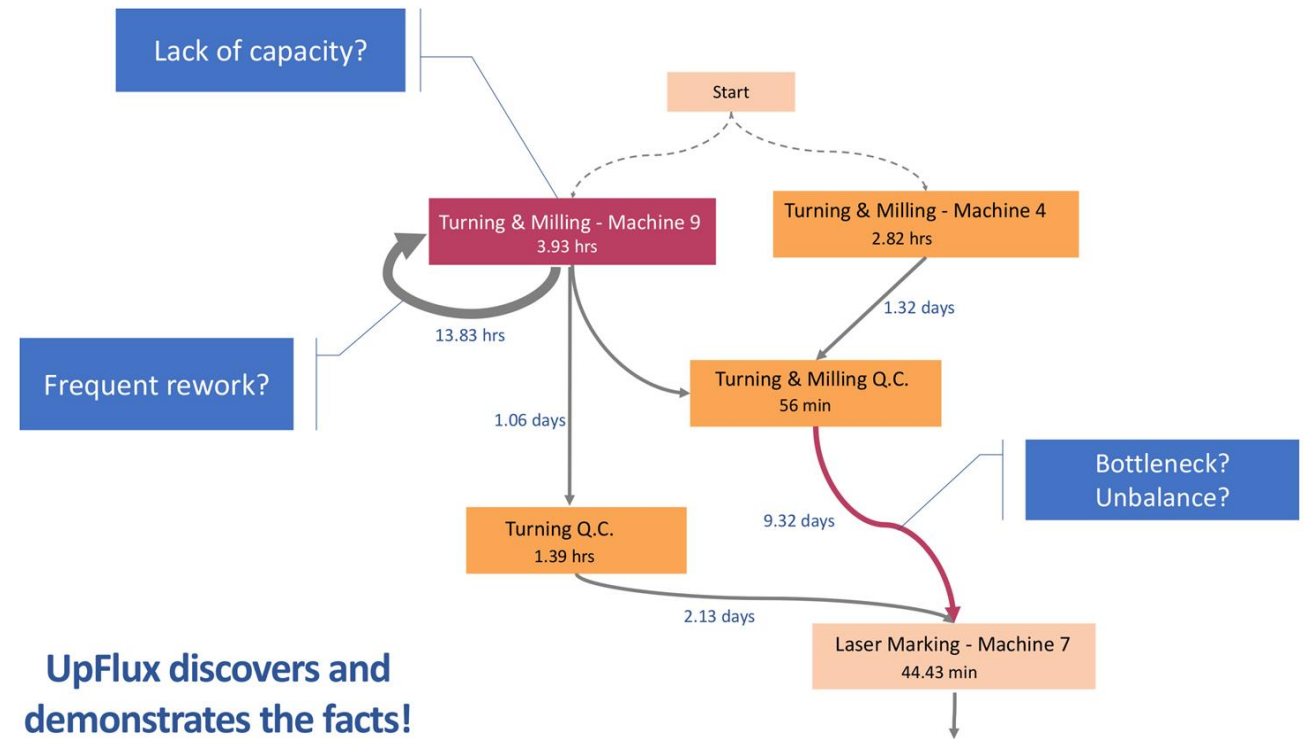**Activity**

Activities names

**When**

**Time-stamp**

Date/time of event

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# Example of an *Event log*

| Case | Activity | Related dates |
|------|----------|---------------|

| Production Order | Activity | Start Timestamp | Complete Timestamp |
|---|---|---|---|
| 20000 | Turning & Milling - Machine 4 | 2012/01/29 23:24:00.000 | 2012/01/30 05:43:00.000 |
| 20000 | Turning & Milling - Machine 4 | 2012/01/30 05:44:00.000 | 2012/01/30 06:42:00.000 |
| 20000 | Turning & Milling - Machine 4 | 2012/01/30 06:59:00.000 | 2012/01/30 07:21:00.000 |
| 20000 | Turning & Milling - Machine 4 | 2012/01/30 07:21:00.000 | 2012/01/30 10:58:00.000 |
| 20000 | Turning & Milling Q.C. | 2012/01/31 13:20:00.000 | 2012/01/31 14:50:00.000 |
| 20000 | Laser Marking - Machine 7 | 2012/02/01 08:18:00.000 | 2012/02/01 08:27:00.000 |
| 20000 | Final Inspection Q.C. | 2012/02/16 12:43:00.000 | 2012/02/16 13:58:00.000 |
| 20000 | Packing | 2012/02/17 00:00:00.000 | 2012/02/17 01:00:00.000 |
| 30000 | Turning & Milling - Machine 9 | 2012/01/17 07:01:00.000 | 2012/01/17 11:05:00.000 |
| 30000 | Turning Q.C. | 2012/01/17 11:00:00.000 | 2012/01/17 11:15:00.000 |
| 30000 | Turning & Milling - Machine 9 | 2012/01/17 19:24:00.000 | 2012/01/17 20:01:00.000 |
| 30000 | Turning & Milling - Machine 9 | 2012/01/17 20:01:00.000 | 2012/01/17 23:43:00.000 |
| 30000 | Turning & Milling - Machine 9 | 2012/01/17 23:49:00.000 | 2012/01/18 06:32:00.000 |
| 30000 | Turning & Milling - Machine 9 | 2012/01/18 06:59:00.000 | 2012/01/18 07:24:00.000 |
| 30000 | Turning & Milling - Machine 9 | 2012/01/18 16:33:00.000 | 2012/01/18 17:55:00.000 |

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# So we can discover the process, and then, to ask the right questions

# How Process Mining works

Process
data

Process Discovery,
visualization and
analysis
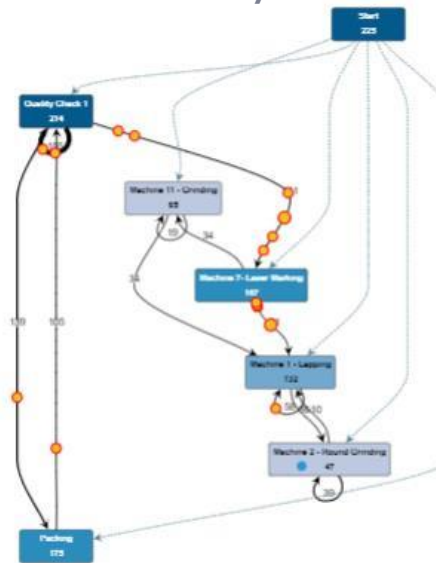
Continuous
improvement

**Operational Efficiency**
Increase your process performance

**Smart audits**
Detect nonconformities and frauds

**Real-time monitoring**
Analyze the reliability of your
process

# Process discovery, visualization and analysis

- What are the <u>alternative flows</u> of your process?

- What are the <u>most frequent activities and paths</u>?

- Where are the <u>deviations and bottlenecks</u>?

- Do the processes of different units <u>occur in the same way</u>?
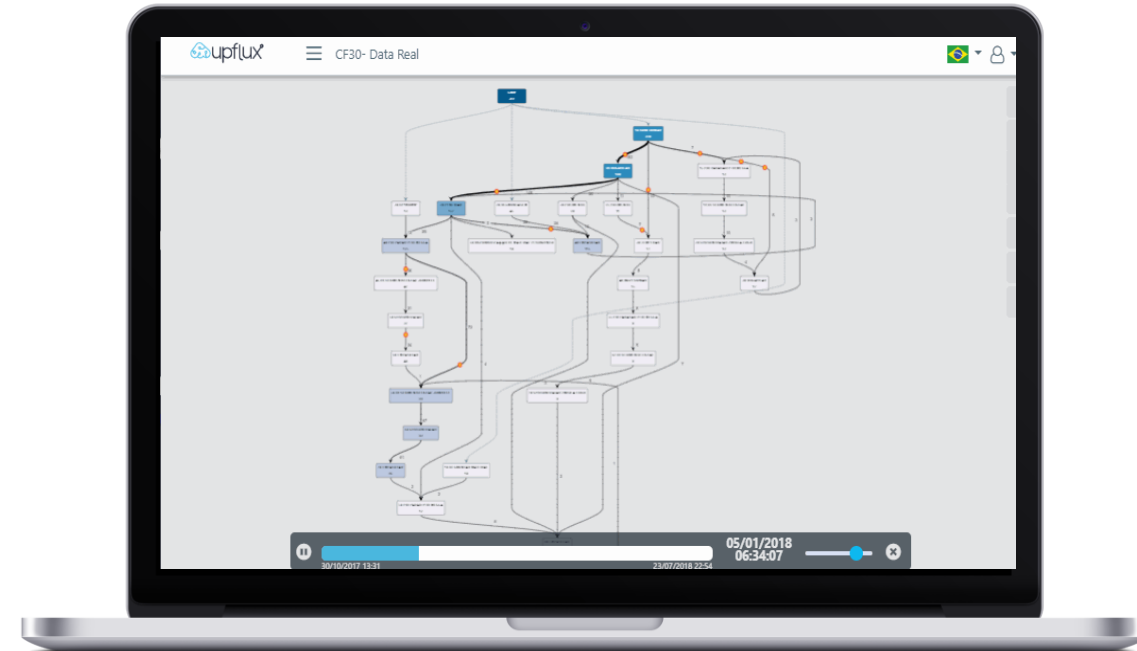
# Smart audits

- Audit the entire process, not just a sample.

- In real time, not after 30 days.

- Conformance checking: identify violations, deviations and frauds.

- Discover and refine your "expected" process.
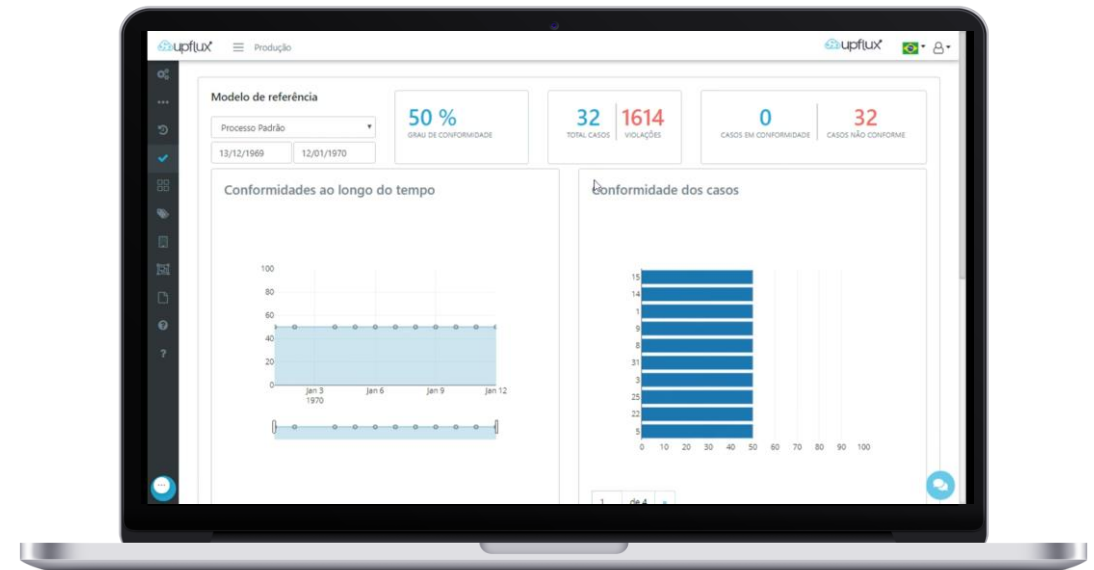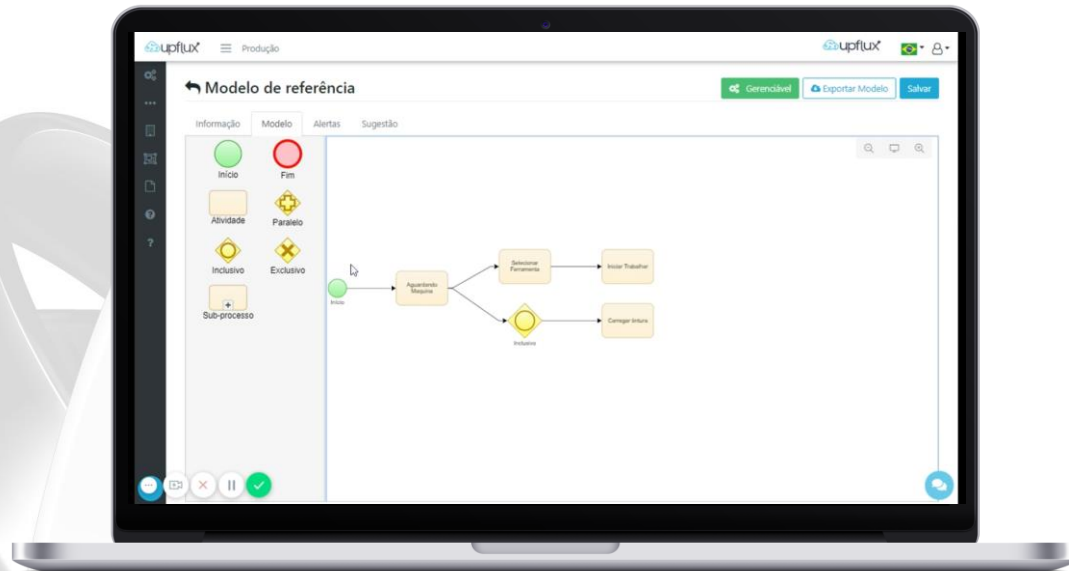
# Social or Organizational Mining
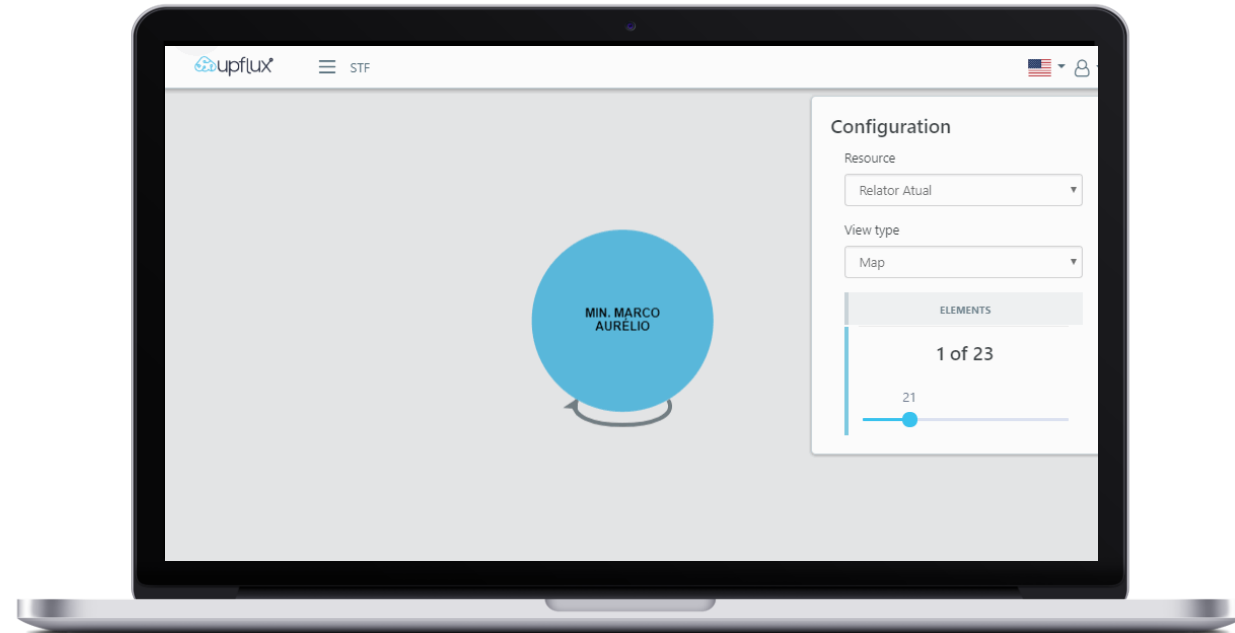


From the hierarchical analysis to an organic analysis in social networks

# Demo

# Demo

- Dataset: https://data.4tu.nl/search?q=:keyword:%20Collection%3A%20BPI%20Challenge%202014

- Tool: www.upflux.net

- Backup (datasets and dataset generators):
- https://www.tf-pm.org/resources/logs
- https://www.mockaroo.com/
- https://www.generatedata.com/

# Thanks a lot!

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# Additional slide(s)