Simulation Based Tools for Regular Oversight of Payment Systems – Case: Bank of Finland

8th Payment and Settlement System Simulation Seminar and Workshop

26-27 August, 2010

Tatu Laine & Tuomas Nummelin

Bank of Finland

Disclaimer

Presented views are those of the authors and do not necessarily reflect the view of Bank of Finland

Also

The views of the authors are subject to changes without prior notice… (i.e. work in progress)

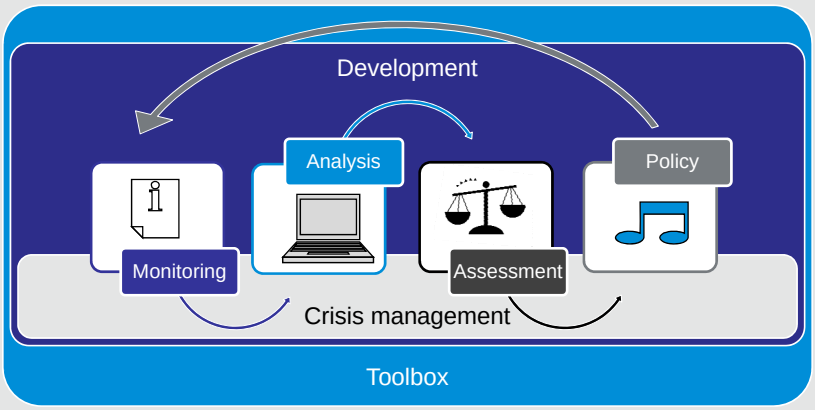
Agenda

- Introduction
- Concept
- Toolbox
- Summary

Agenda

- Introduction
- Concept
- Toolbox
- Summary

Oversight Vehicle



network analysis
financial stability
accessability
monitoring
quality
process oriented
tools
investigating
aggregative
combination
visual
quantitative analysis
process flow
customer focused
best practises
concept
toolbox
workflow
change detection
automatic
customization
improvement
usability
standardization
possible
data
versatile
quantitative
simple
flexibility
scalability
qualitative analysis
stress test
simulator

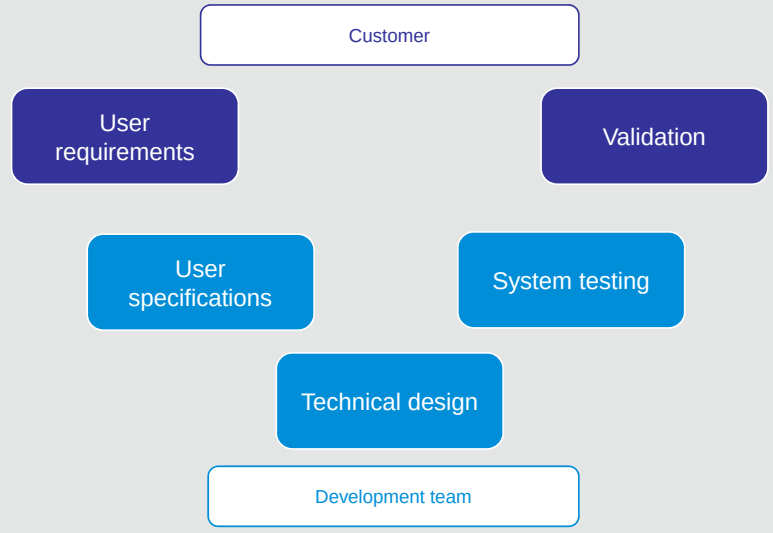
Project Goal

” To identify and develop recurrent **reports** and **analysis** to serve the **oversight function** and by taking advantage of the **BoF-PSS2 simulator**”

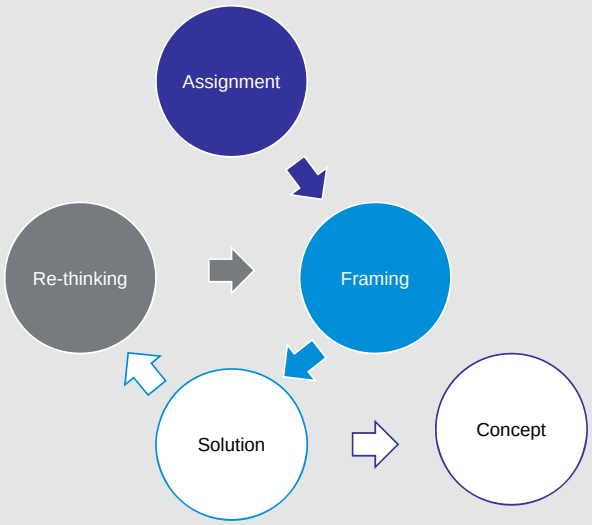
Agenda

- Introduction
- Concept
- Toolbox
- Summary

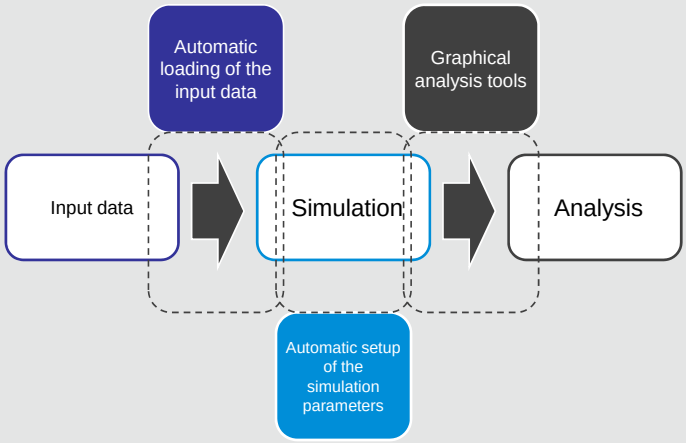
Development Process



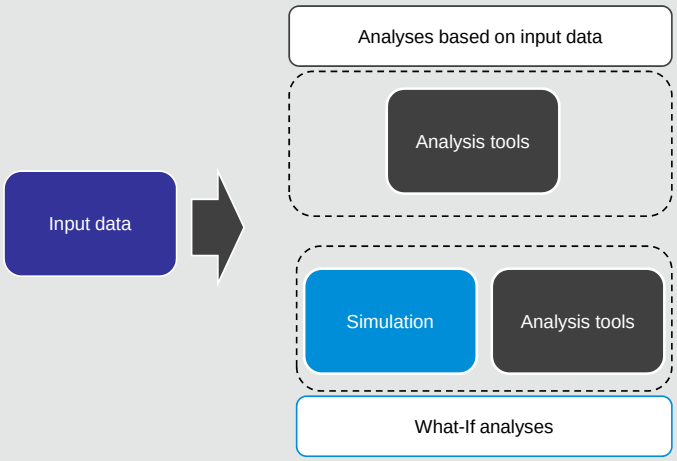
Development Path



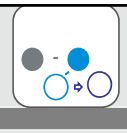
First Trial



Re-thinking Framing



Final Concept



Input data

- Automatic input data loading

Data analyses

- Change detection
  - Automatic detection of change
- Describing data
  - •Payment flow distributions
  - •Network indicators
  - •Distribution evolution
  - •Payment flow structure
  - •Importance of the participants

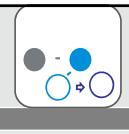
Simulation analyses

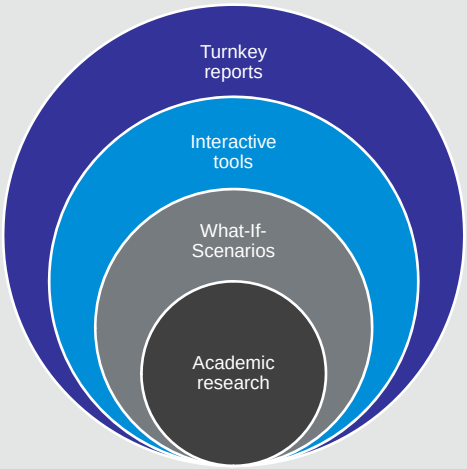
- Automatic testing
  - •Liquidity screener
  - •Criticality screener
  - •Bottleneck finder
- What-If-Scenarios
  - •Technical failure
  - •Default of a participant and new deal of the payment flows
  - •New participant
  - •Stinking participant
  - • New CCP
  - •Liquidity adjustment

Structure matrix | 2D-Histogram | Histogram evolution | Limits and collateral

Importance of the participants | Network indicators | Net flows | Kernel pictures | Sub vs. Sett

Level of Automation in Analysis

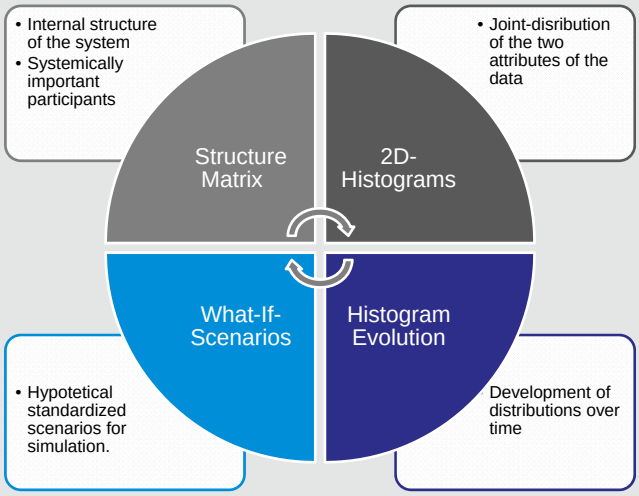




Agenda

- Introduction
- Concept
- **Toolbox**
- Summary

Novelty Concepts – Toolbox

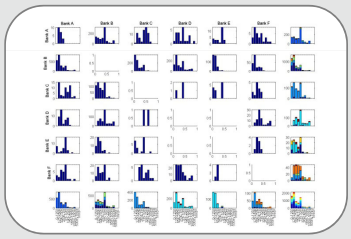


Novelty Concepts – Structure of the System

Structure Matrix

- Opening the internal structure of the system
- Showing the systemically important participants and connections.
- Usefull tool in both case with raw data and with simulation results.

- Many options to show data in this format.
- Can be used with aggregated results and with detailed data.

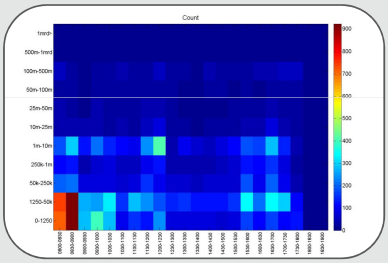


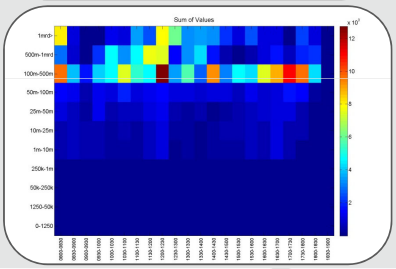
Novelty Concepts – Relationship Between Atributes

2D-Histogram

- Describing relationship between two variables.
- Showing the structural patterns of the system.
- Pointing out interesting variable combinations

- The chosen bins define the values of the variables which will be considered as equal.
- The results can be show as in counts, frequencies or as a sum of a value of the transactions fall in the bin.

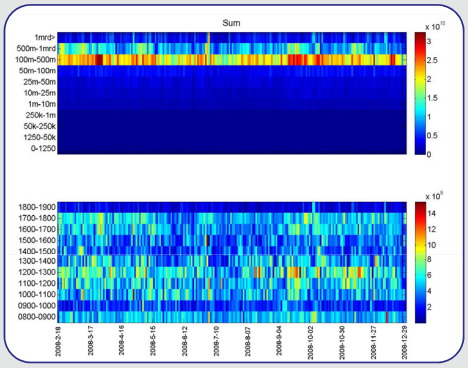




Novelty Concepts – Evolution in Time or Simulation Scenarios

Histogram Evolution

- Describing evolution of the distributions of the certain variables over the time for example.
- Could incorporate automated 'change' detection.



- The automatic change detection is based on the ideas of the statistical process control.
- Expands the comparison of aggregated indicators to the comparison of distributions.

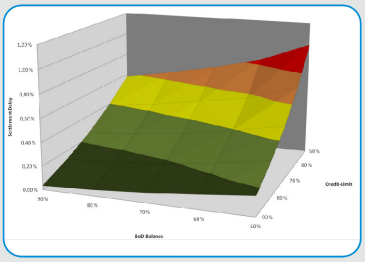
Novelty Concepts – Hypotetical Cases

What-If-Scenarios

- Standardized and parameterized alternative scenarios.
- Automated scenario creation for Bof-PSS2 simulator i.e. modifying the input data to represent the what-if-scenario.

- Modifies the input data based on standardised scenarios and sets up simulation parameters for the simulator.

Screener

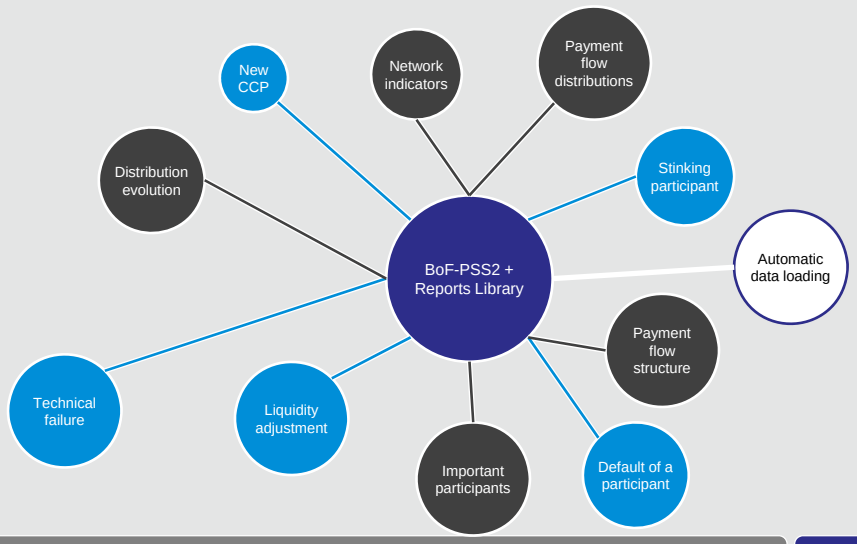


- Samples the individual what-if-scenarios.
- Draws results from larger pool of possible what-if-scenarios.

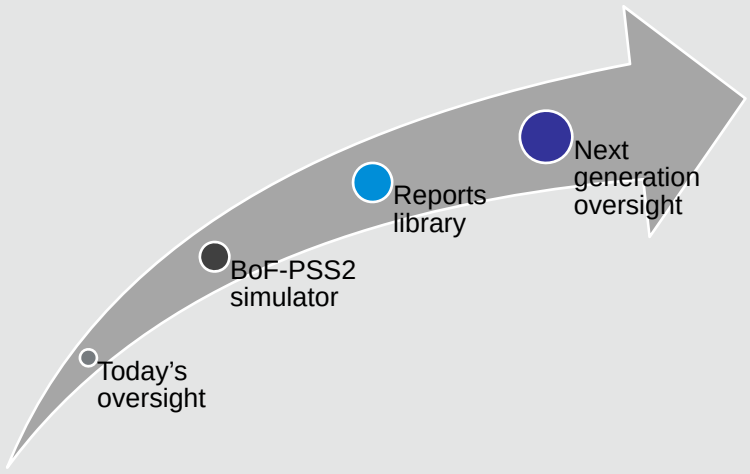
Agenda

- Introduction
- Concept
- Toolbox
- Summary

BoF-PSS2 + Reports Library



We have a dream…



Thank you!

complex problems – simple solutions :)

EUROJÄRJESTELMÄ
EUROSYSTEMET

Questions?