Chapter 12
Analyzing “Spaghetti Processes”

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Overview

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Remember:
How can process mining help?

- Detect bottlenecks
- Detect deviations
- Performance measurement
- Suggest improvements
- Decision support (e.g., recommendation and prediction)

- Provide mirror
- Highlight important problems
- Avoid ICT failures
- Avoid management by PowerPoint
- From “politics” to “analytics”
Example of a Spaghetti process

Spaghetti process describing the diagnosis and treatment of 2765 patients in a Dutch hospital. The process model was constructed based on an event log containing 114,592 events. There are 619 different activities (taking event types into account) executed by 266 different individuals (doctors, nurses, etc.).
Fragment
18 activities of the 619 activities (2.9%)
Another example
(event log of Dutch housing agency)

The event log contains 208 cases that generated 5987 events. There are 74 different activities.
L* approach for Spaghetti processes

Focus on Stages 0-2, Stage 3 is typically only partially possible, Stage 4 requires more structure.
Spaghetti processes are typically encountered in product development, service, resource management, and sales/CRM. Lasagna processes are typically encountered in production, finance/accounting, procurement, logistics, resource management, and sales/CRM.
Any process model can be simplified: filtering

Filtering in ProM 6: select top 80% of activities in event log of housing agency.
Effect of filtering
(event log of Dutch housing agency)
Filtering in ProM
5.2: select activities that appear in more than 5% of the cases in the hospital log.
Trade-off

split heterogeneous log into smaller more homogeneous logs

entire event log

fewer models, but more complex

more models, but simpler

smaller event logs each corresponding to a “simple” process model
Fuzzy mining
(event log of Dutch housing agency)
More Spaghetti processes

Processes of ASML, Philips Healthcare, and AMC.
Test process ASML

• **ASML** is the world’s leading manufacturer of chip-making equipment and a key supplier to the chip industry.

• The testing of manufactured **wafer scanners** is an important, but also time-consuming, process.

• Every wafer scanner is tested in the factory of ASML. When it passes all tests, the wafer scanner is disassembled and shipped to the customer where the system is re-assembled (and tested again).
About the example log

• The event log containing 154,966 events.
• The event log contained information about 24 carefully chosen wafer scanners (same type, same circumstances, and having complete logs).
• The number of events per case (i.e., the length of the executed test sequence) in this event log ranges from 2820 to 16250 events.
• There are 360 different activities, all identified by four letter test codes.
• Each instance of these 360 activities has a start event and complete event.
Discovered process model (just complete events)
Conformance checking

• ASML also had a so-called reference model describing the way that machines should be tested.
• This reference model is at the level of job steps rather than test codes. However, ASML maintains a mapping from the lower level codes to these higher level activities. Comparing the reference model and our discovered model (both at the job step and test code level) revealed interesting differences.
• Moreover, using the ProM’s conformance checker we could show that the average fitness was only 0.375, i.e., less than half of the events can be explained by the model.
• When replaying, we discovered many activities that had occurred but that should not have happened according to the reference model and activities that should have happened but did not.
Philips Healthcare: Allura Xper systems

• Philips Healthcare is one of the leading manufacturers of medical devices, offering diagnosing imaging systems, healthcare information technology solutions, patient monitoring systems, and cardiac devices.

• Philips Remote Services (PRS) is a system for the active monitoring of systems via the Internet. PRS has been established to deliver remote technical support, monitoring, diagnostics, application assistance, and other added value services.

• We analyzed the event logs of Allura Xper systems. These are X-ray systems designed to diagnose and possibly assist in the treatment of all kinds of diseases, like heart or lung diseases, by generating images of the internal body.
Fuzzy miner tailored towards the needs of Philips Healthcare
Group of 627 gynecological oncology patients treated in 2005 and 2006.

The event log contains 24331 events referring to 376 different activities.
Social network
(between different organizational units of the AMC hospital)
Analyzing “Spaghetti Processes”

More difficult, but …

the potential gains are also more substantial.