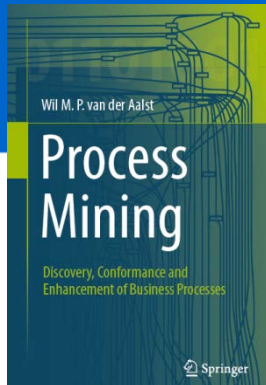


Process Mining: Data Science in Action

How To Conduct a Process Mining Project?

prof.dr.ir. Wil van der Aalst
www.processmining.org



TU/e Technische Universiteit
Eindhoven
University of Technology

Where innovation starts

Drowning in data ...

**How to conduct a
process mining
project?**



Process mining use cases

Minimize mean flow time, waiting time, response time, etc.

Improve Key Performance Indicators (KPIs).

improve KPIs related to **time**

goal

improve KPIs related to **costs**

improve KPIs related to **quality**

Maximize service levels, i.e., percentage handled within agreed upon period.

use case

action

redesign (improve process)

adjust (improve control)

intervene (handle problem in ad-hoc manner)

support (detect, predict, recommend)

Process mining use cases

Redesign: Structural changes to the process based on insights, e.g., making the process more concurrent or adding controls.

Adjust: Non structural (i.e., temporary) changes, e.g., adding more resources because of fluctuations in case volume.

improve KPIs related to **time**

goal

action

redesign (improve process)

adjust (improve control)

improve KPIs related to **costs**

use case

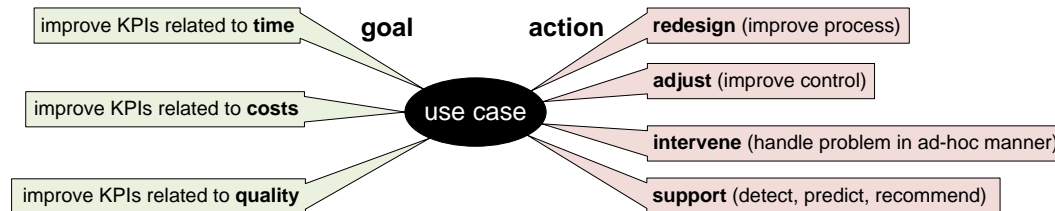
intervene (handle problem in ad-hoc manner)

support (detect, predict, recommend)

Support: Systematically using pre mortem event data, e.g., for recommending the activity most likely to minimize the flow time.

Process mining use cases

- Identification of bottlenecks to trigger a process redesign that reduces the overall flow time with 30%.
- Identification of compliance problems using conformance checking. Some of the compliance problems result in ad-hoc interventions whereas others lead to adjustments of the parameters used for work distribution.
- Harmonization of two processes after a merger based on a comparison of the actual processes. The goal of such a harmonization is to reduce costs.
- Predicting of the remaining flow time to improve customer service.
- Providing recommendations for resource allocation aiming at a more balanced utilization of workers.
- Identification of exceptional cases that generate too much additional work. By learning the profile of such cases, they can be handled separately to reduce the overall flow time.
- Visualization of the 10 most complicated or time consuming cases to identify potential risks.

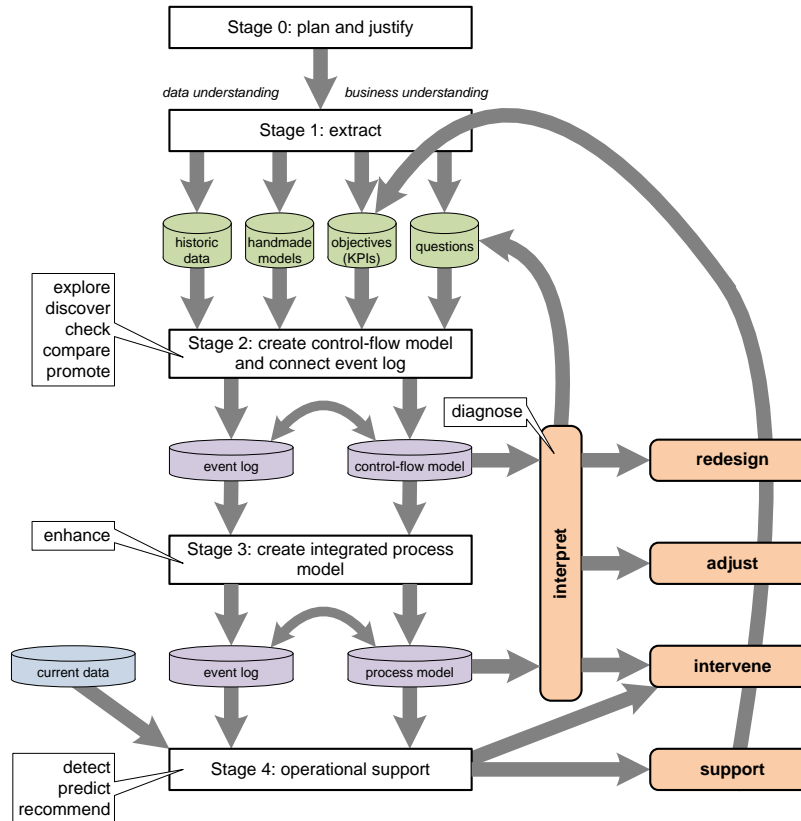


A blurred background image of a business meeting. Four people in professional attire are gathered around a table, looking at documents. In the foreground, a white mesh pen holder contains several yellow and white pens. On the table, there are several documents, including one with a blue bar chart and a red line graph, and another with the word 'GLOBAL' visible. A pair of black-rimmed glasses rests on the documents. The overall scene is brightly lit, suggesting an office environment.

L* lifecycle model for process mining

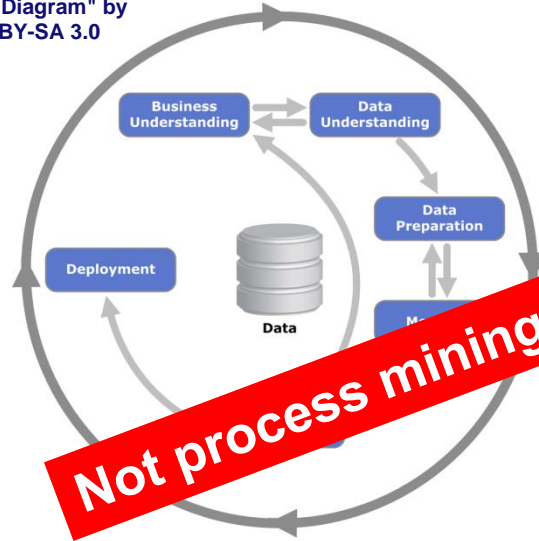
L* lifecycle model for process mining

Describes the lifecycle of an idealized process mining project (assuming "Lasagna processes").



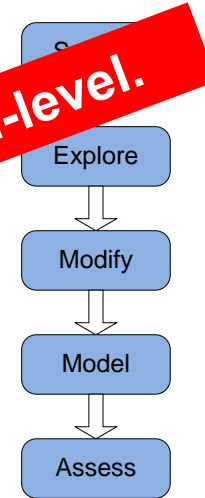
Similar to reference models describing the lifecycle of a typical data mining/Bi project

"CRISP-DM Process Diagram" by
Kenneth Jensen CC BY-SA 3.0



CRISP-DM

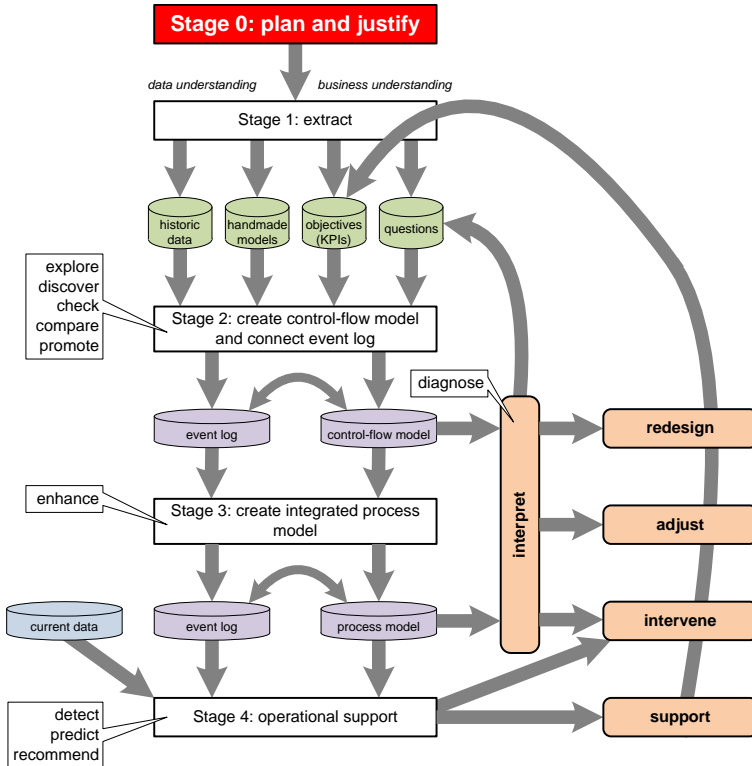
Cross-Industry Standard
Process for Data Mining



SEMMA

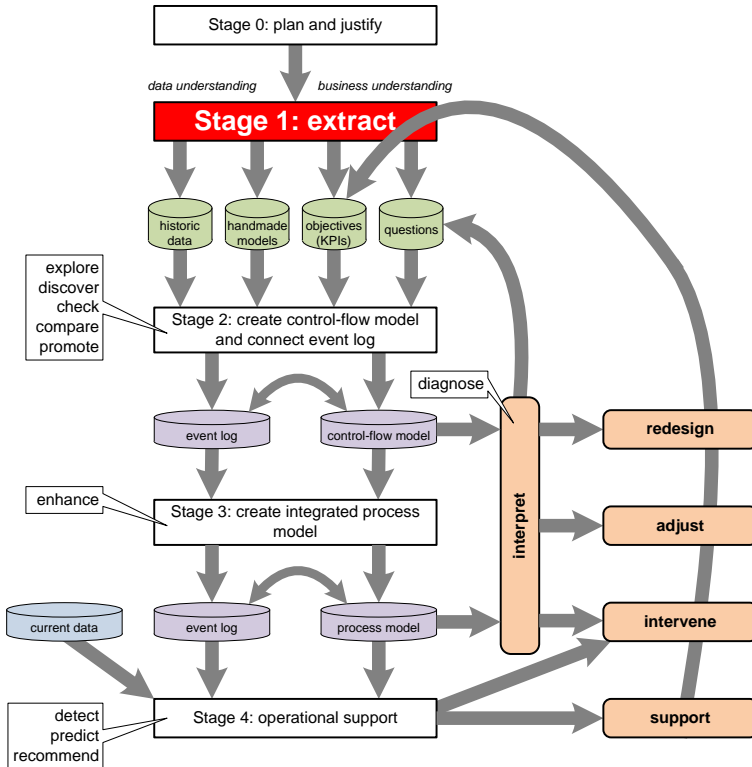
Sample, Explore, Modify, Model
and Assess [SAS Institute]

Stage 0: Plan and justify



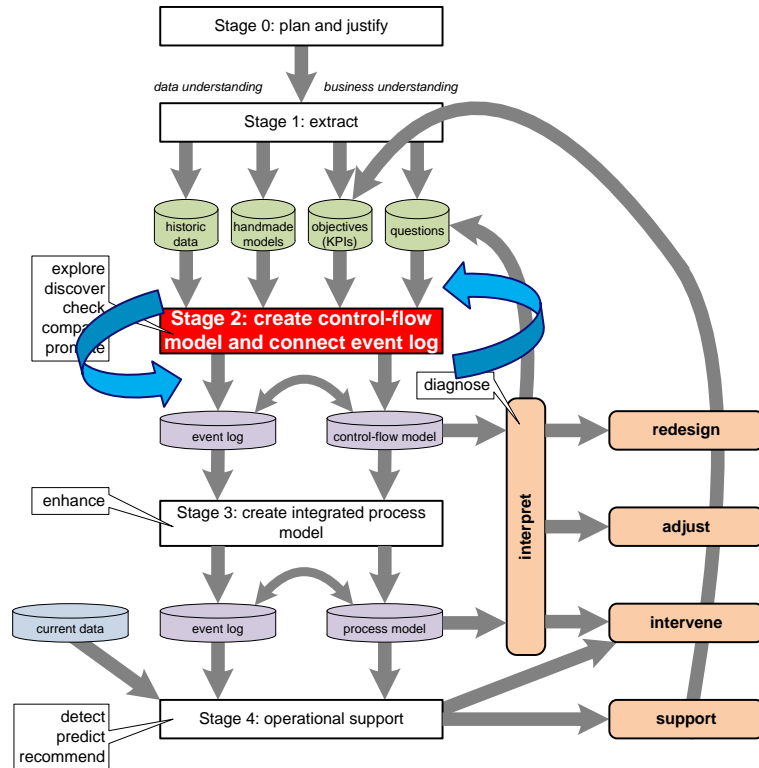
- Three types of projects:
 - data-driven ("curiosity" driven)
 - question-driven ("why?")
 - goal-driven (improve KPI)
- Plan project.
- Justify planned activities ("business case").

Stage 1: Extract



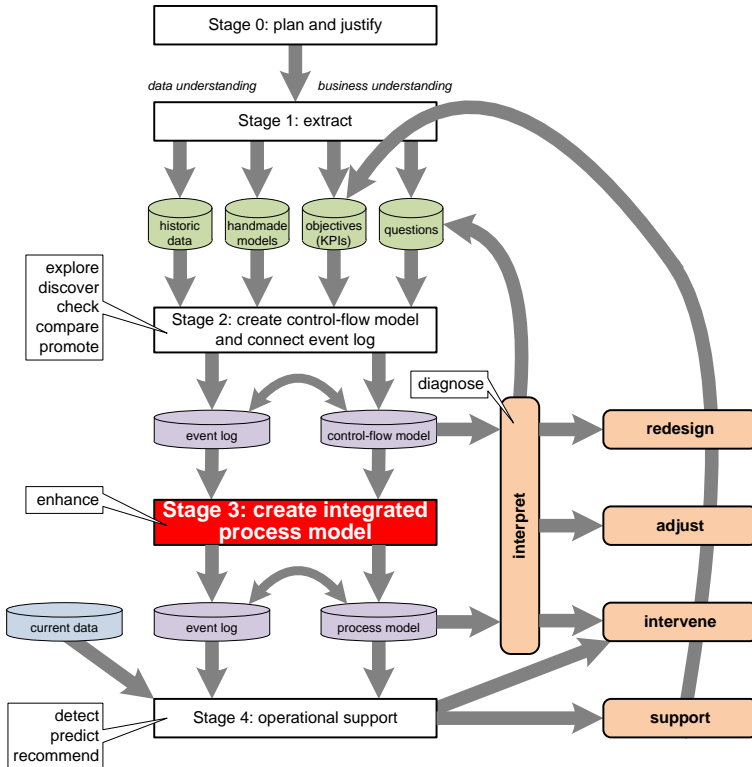
- **Locate, extract and transform event data (non-trivial, see previous lectures).**
- **Moreover, collect:**
 - models and other artifacts,
 - objectives (KPIs), and
 - questions.
- **Exploit existing (domain) knowledge!**

Stage 2: Create control-flow model and connect event log



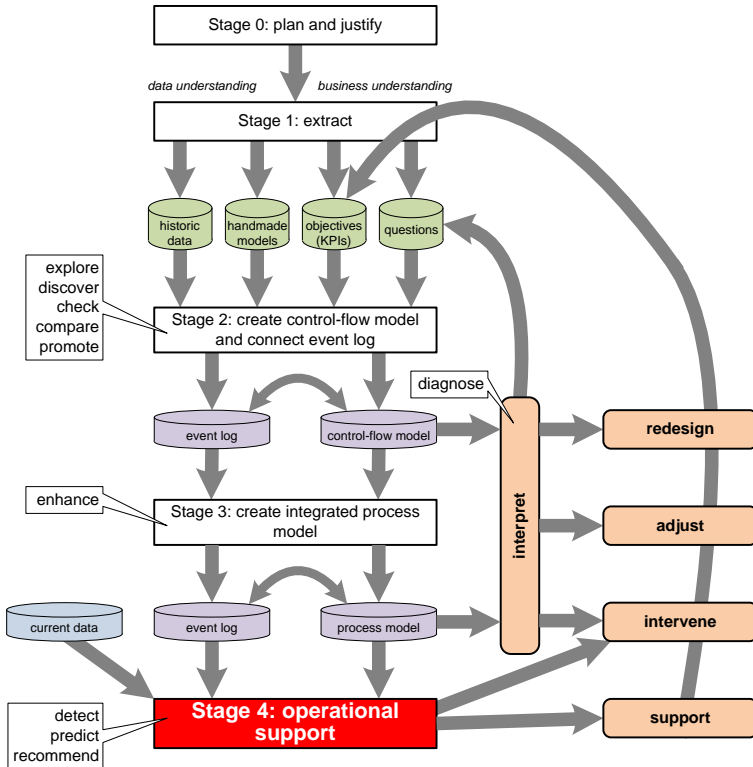
- Control-flow is the backbone of any process.
- Therefore, first create a suitable control-flow model well-connected to the available event data.
- Conformance checking and alignments are key!
- Iterative (like other stages).

Stage 3: Create integrated process model



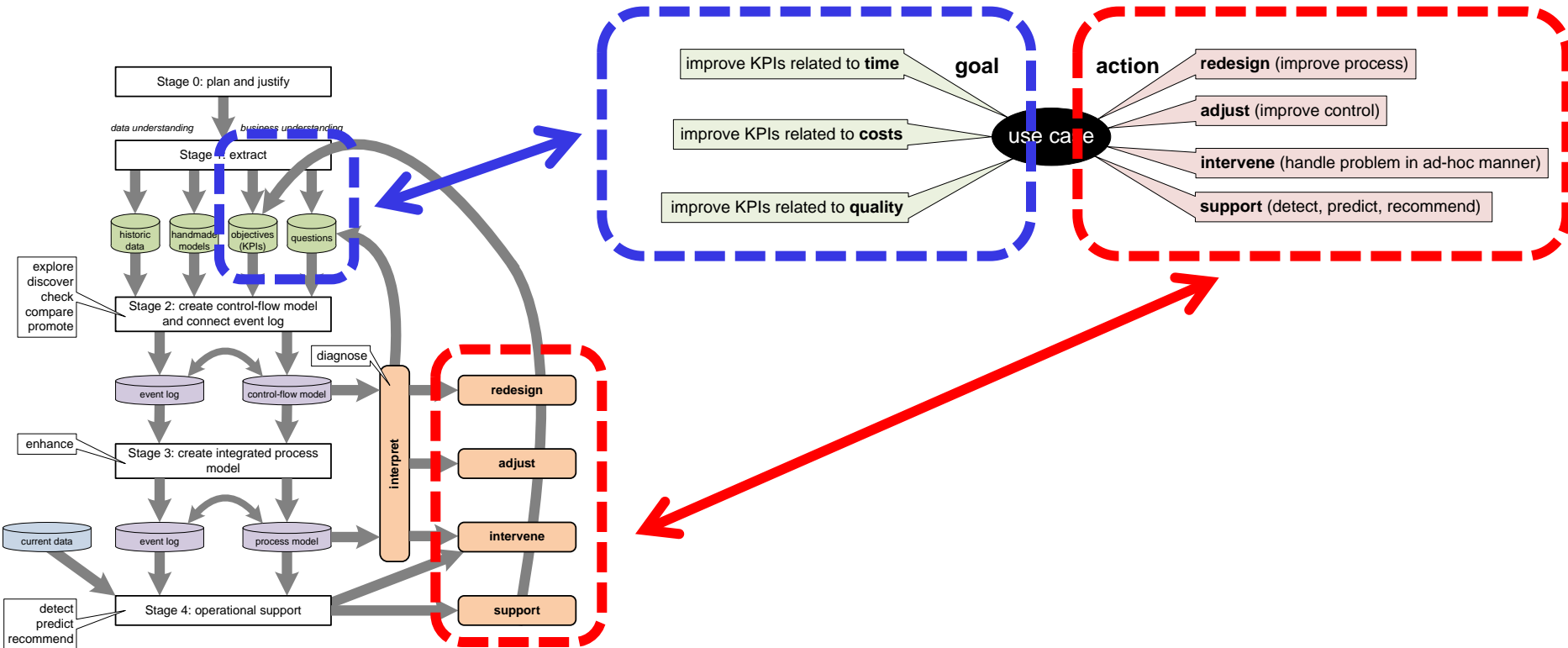
- Replay event data on control-flow model to learn about the other perspectives (time, data, resources, ...).
- Merge into an overall model showing the different perspectives.

Stage 4: Operational support

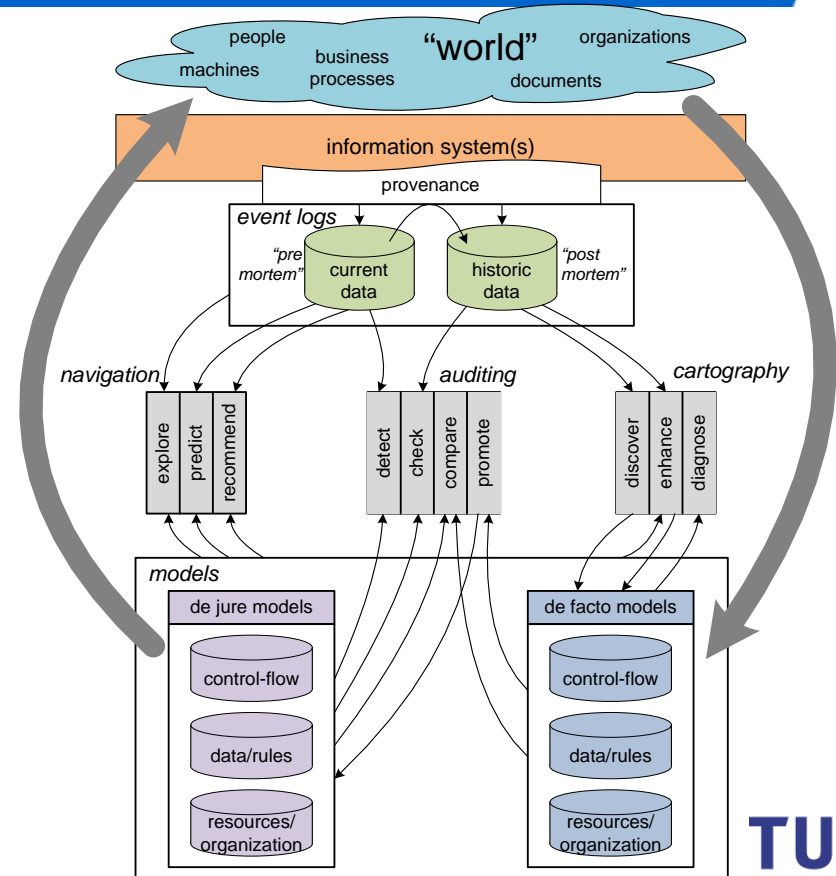
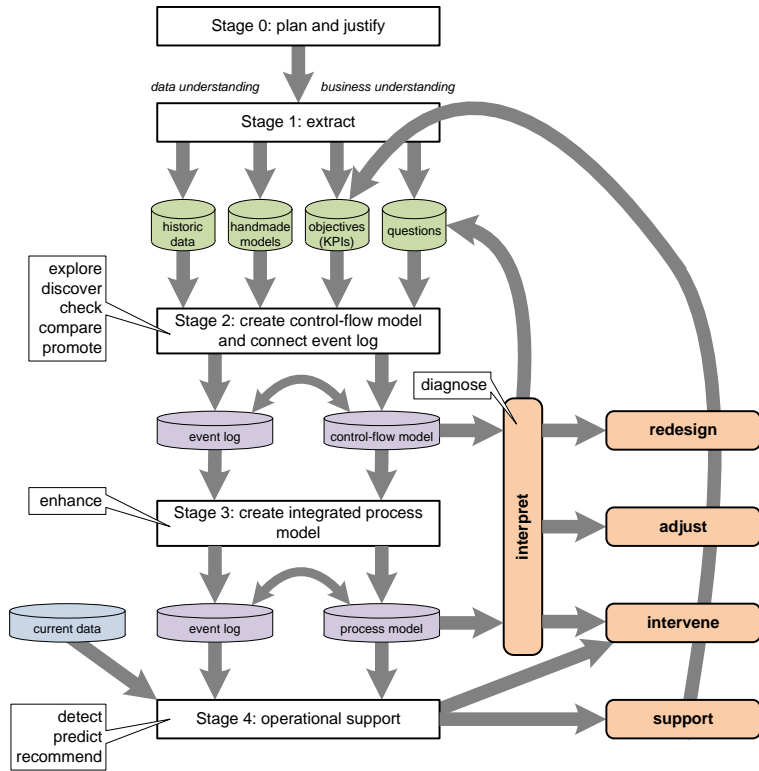


- Use current (pre-mortem) data for on-the-fly deviation detection, predictions, and recommendations.
- Only possible for Lasagna processes!

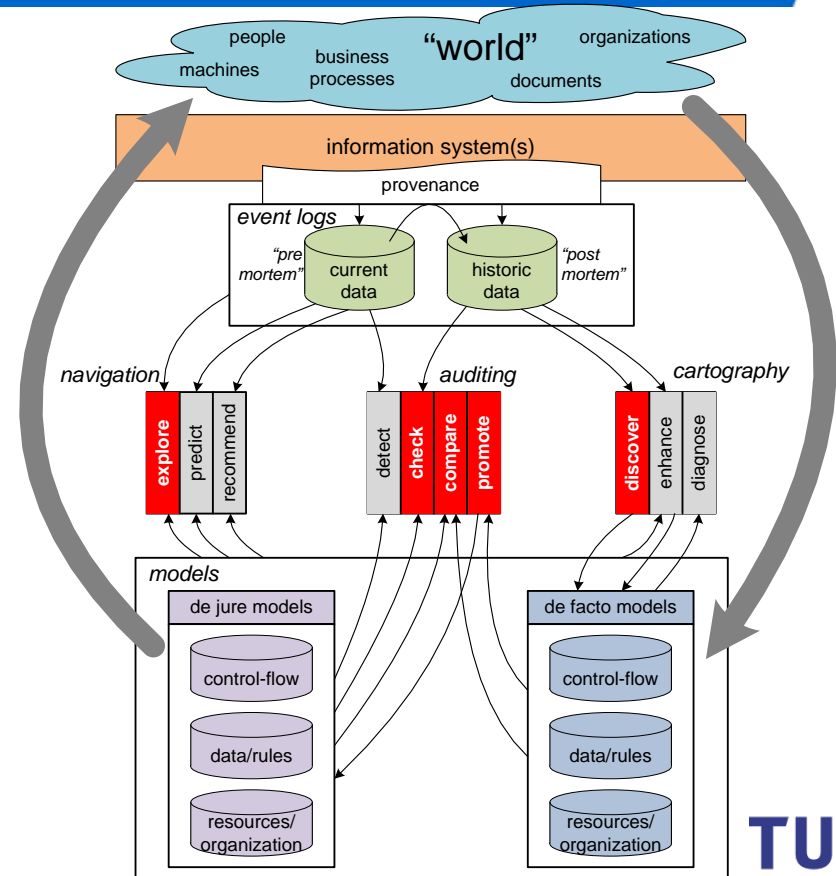
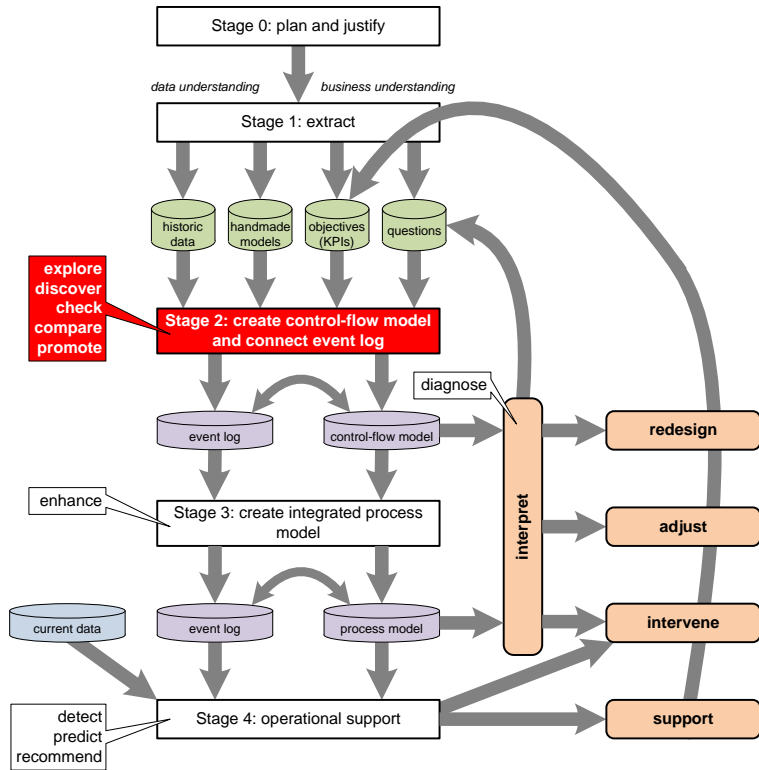
Relation to use cases



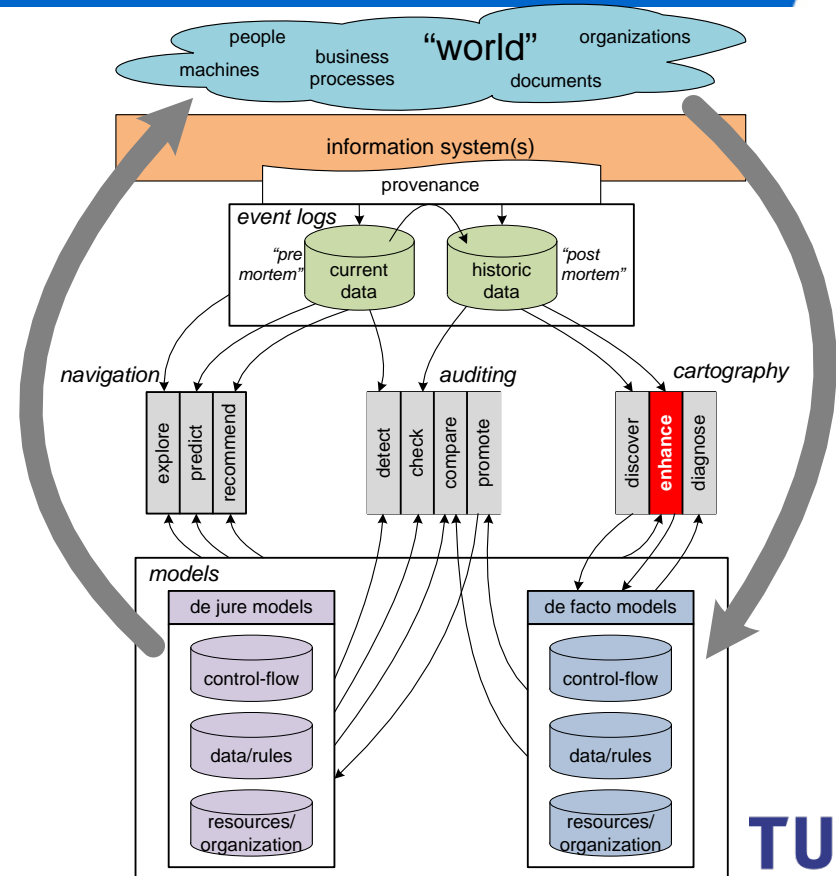
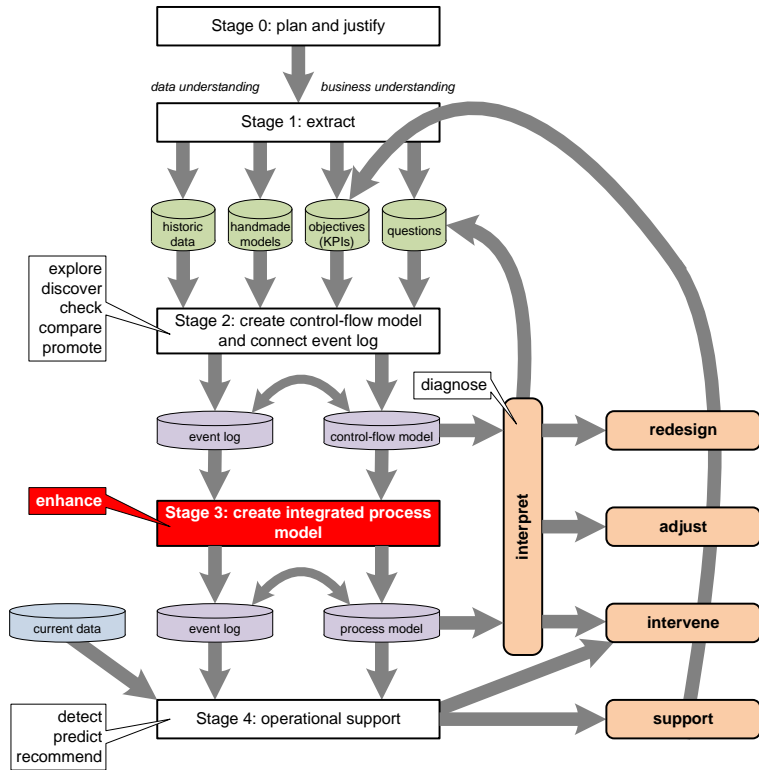
Linking L* to the refined process mining framework



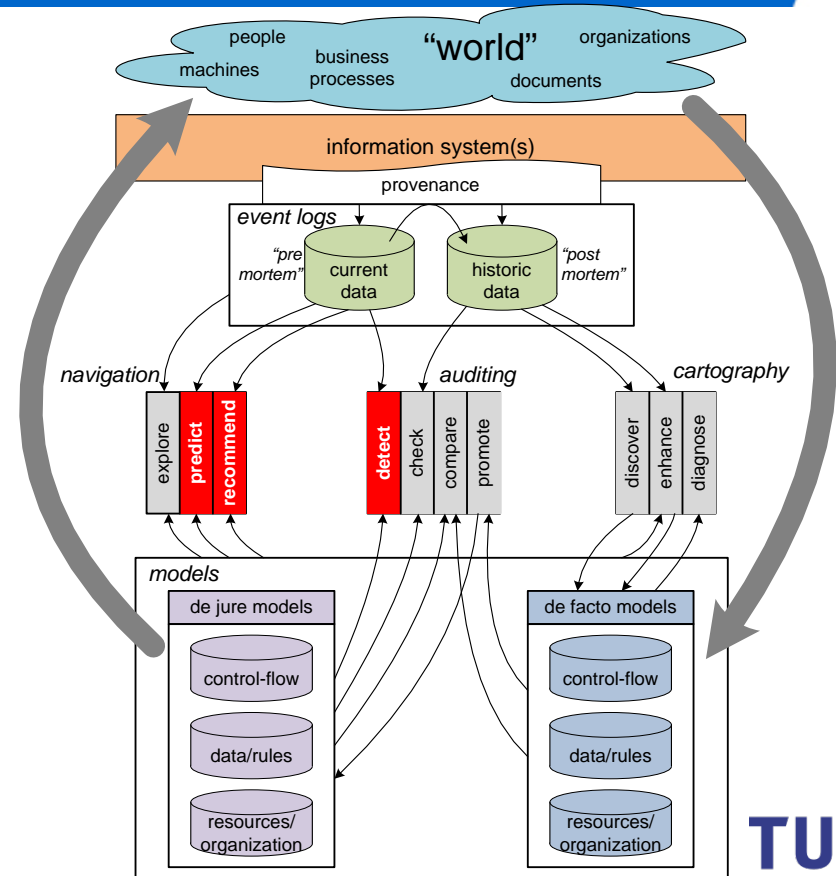
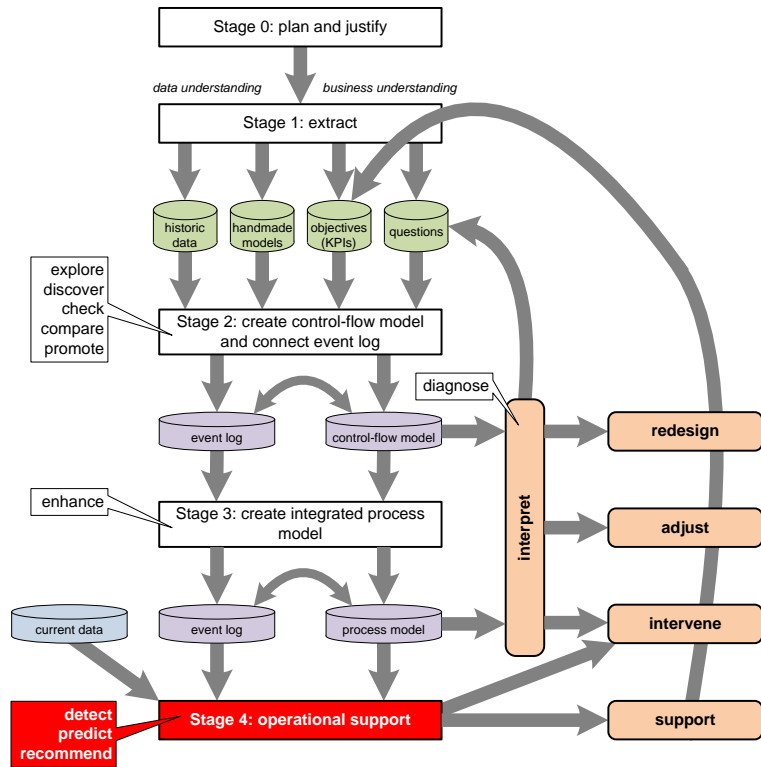
Linking L* to the refined process mining framework



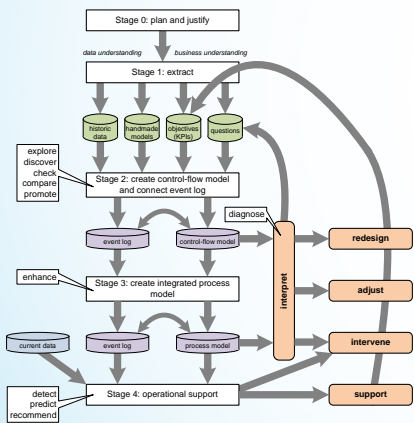
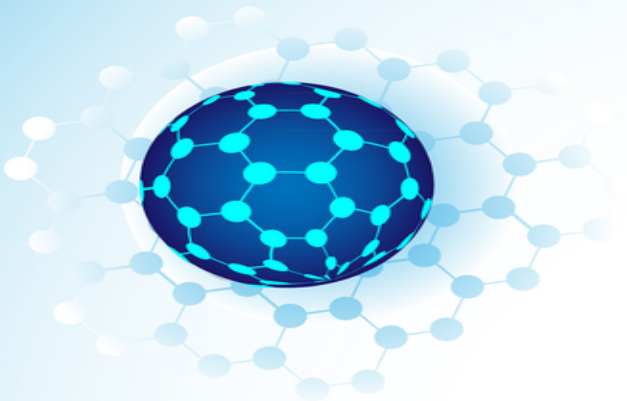
Linking L* to the refined process mining framework



Linking L* to the refined process mining framework



L* lifecycle model for process mining



Part I: Preliminaries

Chapter 1
Introduction

Chapter 2
Process Modeling and
Analysis

Chapter 3
Data Mining

Part III: Beyond Process Discovery

Chapter 7
Conformance
Checking

Chapter 8
Mining Additional
Perspectives

Chapter 9
Operational Support

Part II: From Event Logs to Process Models

Chapter 4
Getting the Data

Chapter 5
Process Discovery: An
Introduction

Chapter 6
Advanced Process
Discovery Techniques

Part IV: Putting Process Mining to Work

Chapter 10
Tool Support

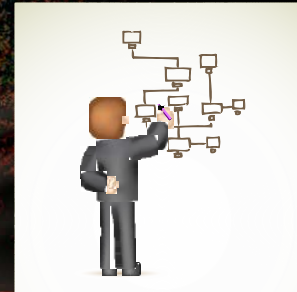
Chapter 11
Analyzing “Lasagna
Processes”

Chapter 12
Analyzing “Spaghetti
Processes”

Part V: Reflect

Chapter 13
Cartography and
Navigation

Chapter 14
Epilogue



Wil M. P. van der Aalst

Process Mining

Discovery, Conformance and
Enhancement of Business Processes

 Springer