Podatkovno rudarjenje po CRISP-DM standardu

2. PREDAVANJE

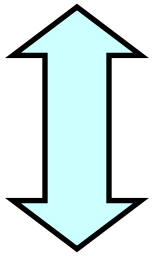
izr. prof. Branko Kavšek

Vsebina predavanja

- Uvod: Kaj in zakaj CRISP-DM?
- Opis posameznih faz in nalog
- Povzetek

Kaj pomeni CRISP-DM?

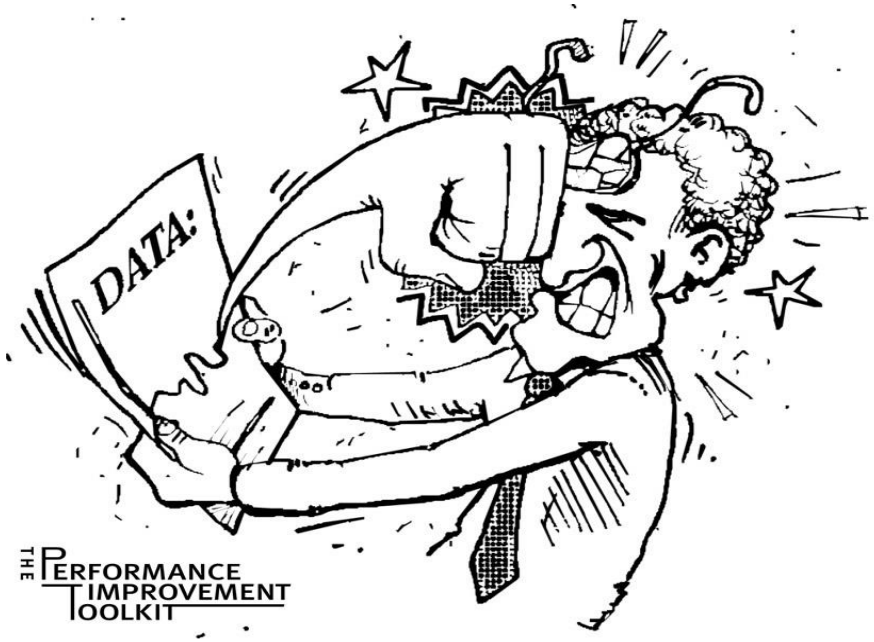
CRoss-**I**ndustry **S**tandard **P**rocess
for **D**ata **M**ining



“Industrijski” standard, ki natančno določa potek analize podatkov s pomočjo podatkovnega rudarjenja.

Zakaj je potrebno proces standardizirati?

Podatkovno rudarjenje je **proces**, ki mora biti **zanesljiv** in **ponovljiv** (s strani ljudi z malo predznanja o podatkovnem rudarjenju) !!!



Zakaj je potrebno proces standardizirati? (2)

- Nudenje okvira za shranjevanje preteklih izkušenj
  - projekte lahko repliciramo
- Lažje planiranje in vodenje projektov
- “Faktor udobja” za nove uporabnike
  - dokazuje zrelost podatkovnega rudarjenja,
  - zmanjšuje odvisnost od t.i. super-strokovnjakov.

Kako je prišlo do standardizacije? (zgodovinski vidik)

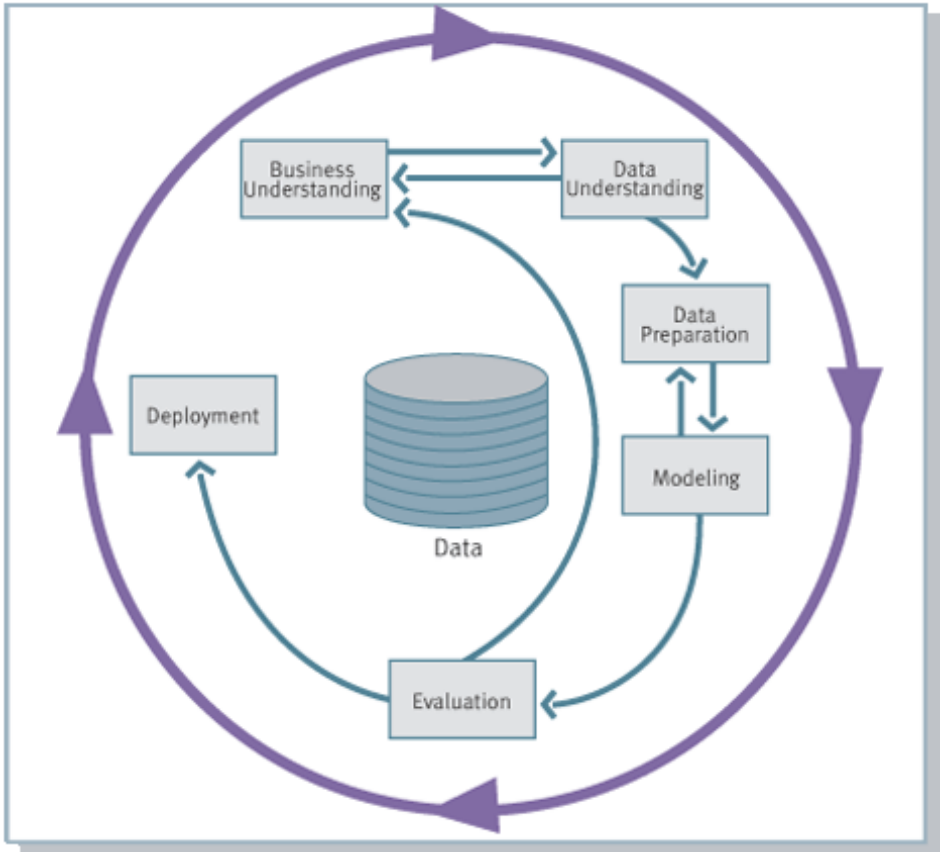
- Iniciativa podana s strani treh takratnih izkušenejših podjetij na področju podatkovnega rudarjenja:
  - Daimler Chrysler (kasneje Daimler-Benz), SPSS (kasneje ISL), NCR;
- Razvoj in dopolnitve na številnih workshop-ih (med leti 1997 in 1999);
- K procesnemu modelu prispevalo več kot 300 organizacij;
- Leta 1999 – izide CRISP-DM 1.0;
- Trenutno več kot 200 članov interesne skupine (SIG) CRISP-DM:
  - Ponudniki: SPSS, NCR, IBM, SAS, SGI, Data Distilleries, Syllogic, itd.
  - Dobavitelji sistemov/svetovalci: Cap Gemini, ICL Retail, Deloitte & Touche, itd.
  - Uporabniki: BT, ABB, Lloyds Bank, AirTouch, Experian, itd.

CRISP-DM je:

- Ne-lastniški
- Neodvisen od aplikacije/problema
- Neodvisen od orodja/programa
- Osredotočen na poslovne probleme
  - pa tudi na tehnični vidik analize same
- Ogrodje, ki služi kot vodilo
- Baza preteklih izkušenj
  - primeri “uspešnih” analiz (template)

CRISP-DM: pregled

Vir:
https://en.wikipedia.org/wiki/Cross_Industry_Standard_Process_for_Data_Mining



- Podatkovno rudarjenje kot **metodologija**
- **Procesni model**
- Za **vsakogar**
- S “komplet” **navodili**
- V ciklu iz **6-ih faz**

Vsebina predavanja

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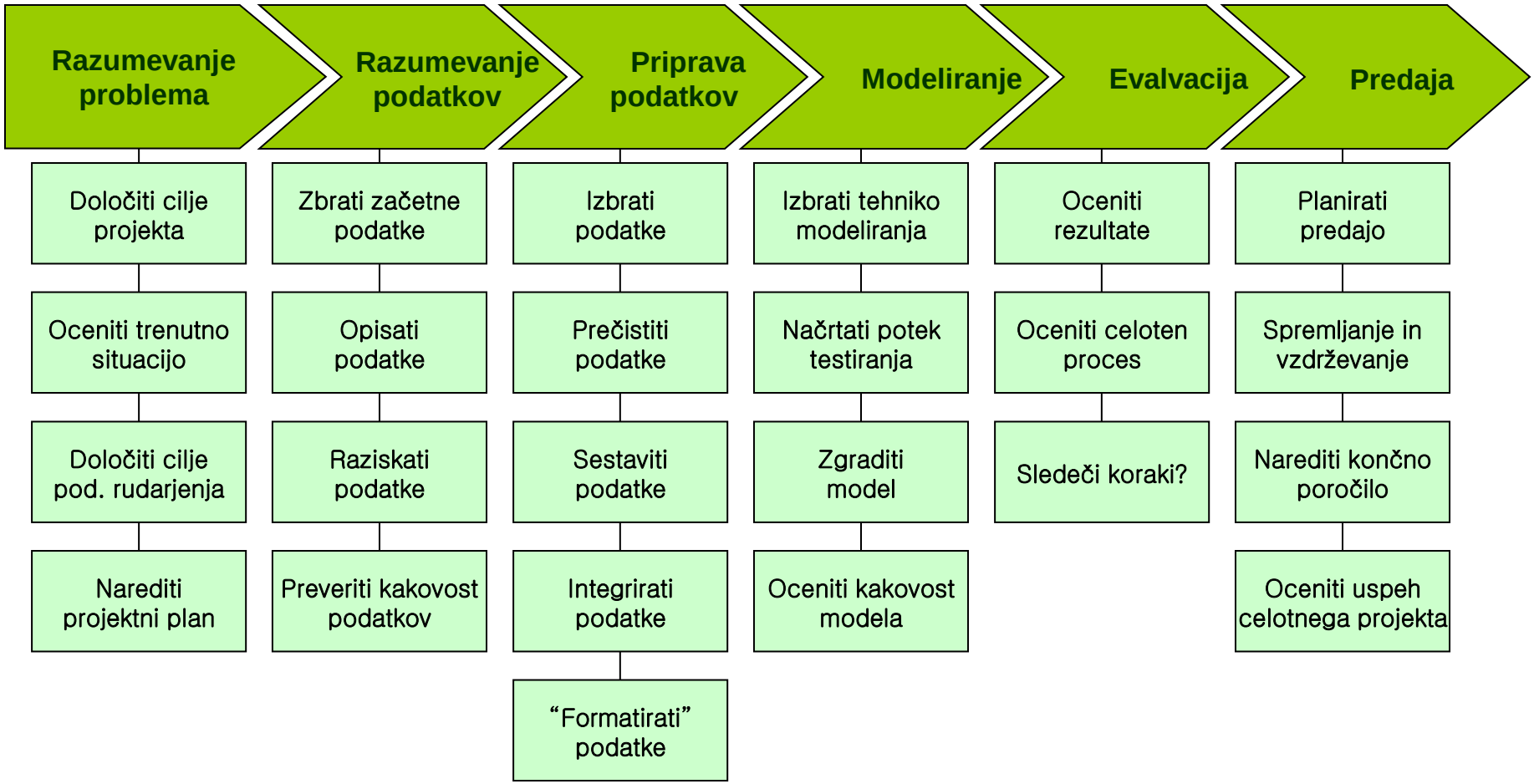
CRISP-DM: faze

1. **Razumevanje problema**:
   razumevanje ciljev in potreb projekta, definicija problema za podatkovno rudarjenje;
2. **Razumevanje podatkov**:
   začetno zbiranje in spoznavanje podatkov, vprašanja glede kakovosti zbranih podatkov;
3. **Priprava podatkov**:
   izbor tabel, atributov, primerov; preoblikovanja in čiščenje podatkov;
4. **Modeliranje**:
   izbor ustreznih tehnik modeliranja in njihova aplikacija, nastavljanje parametrov;
5. **Evalvacija (ocena modelov)**:
   ali smo zadovoljili cilje in potrebe projekta?, ocena – v kolikšni meri smo jih zadovoljili;
6. **Predaja končnemu uporabniku**:
   predaja/implementacija modela z razlago – tako, da je celoten proces ponovliv;

Posamezne faze in naloge

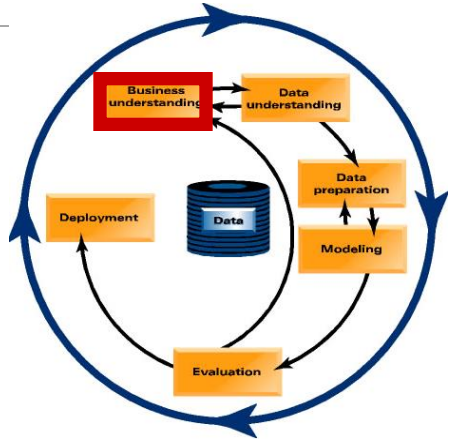


Phase 1. Business Understanding

Statement of **Business Objective**

Statement of **Data Mining Objective**

Statement of **Success Criteria**



Focuses on **understanding the project objectives and requirements from a business perspective**, then **converting this knowledge into a data mining problem definition** and **a preliminary plan designed to achieve the objectives**

Phase 1. Business Understanding

Determine business objectives

- thoroughly understand, from a business perspective, what the client really wants to accomplish

- uncover important factors, at the beginning, that can influence the outcome of the project

- neglecting this step is to expend a great deal of effort producing the right answers to the wrong questions

Assess situation

- more detailed fact-finding about all of the resources, constraints, assumptions and other factors that should be considered

- flesh out the details

Phase 1. Business Understanding

Determine data mining goals

- a business goal states **objectives in business terminology**

- a data mining goal states **project objectives in technical terms**

ex) the business goal: "Increase catalog sales to existing customers."

a data mining goal: "Predict how many widgets a customer will buy,
given their purchases over the past three years,
demographic information (age, salary, city) and the price of the item."

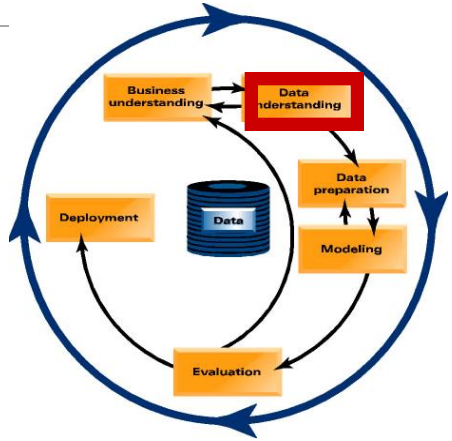
Produce project plan

- **describe the intended plan** for achieving the data mining goals and the business goals

- the plan should **specify the anticipated set of steps to be performed** during the rest of the project including an initial selection of tools and techniques

Phase 2. Data Understanding

- Explore the Data
- Verify the Quality
- Find Outliers



Starts with an initial data collection and proceeds with activities in order to get familiar with the data, to identify data quality problems, to discover first insights into the data or to detect interesting subsets to form hypotheses for hidden information.

Phase 2. Data Understanding

Collect initial data

- acquire within the project the data listed in the project resources
- includes data loading if necessary for data understanding
- possibly leads to initial data preparation steps
- if acquiring multiple data sources, integration is an additional issue, either here or in the later data preparation phase

Describe data

- examine the “gross” or “surface” properties of the acquired data
- report on the results

Phase 2. Data Understanding

Explore data

- tackles the data mining questions, which can be addressed using querying, visualization and reporting including:

  distribution of key attributes, results of simple aggregations

  relations between pairs or small numbers of attributes

  properties of significant sub-populations, simple statistical analyses

- may address directly the data mining goals

- may contribute to or refine the data description and quality reports

- may feed into the transformation and other data preparation needed

Verify data quality

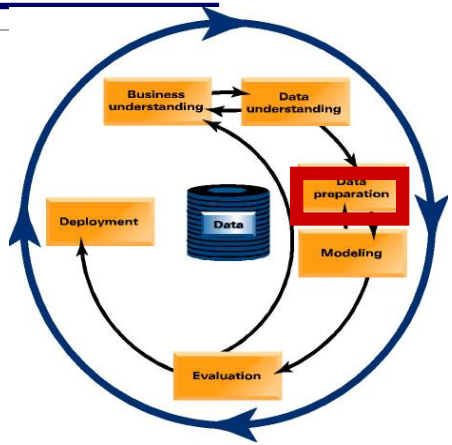
- examine the quality of the data, addressing questions such as:

  "Is the data complete?", Are there missing values in the data?"

Phase 3. Data Preparation

Takes usually **over 90% of the time**

- Collection
- Assessment
- Consolidation and Cleaning
- Data selection
- Transformations



Covers **all activities to construct the final dataset** from the initial raw data. Data preparation tasks are **likely to be performed multiple times** and **not in any prescribed order**. Tasks include **table, record and attribute selection** as well as **transformation and cleaning of data for modeling tools**.

Phase 3. Data Preparation

Select data

- decide on the data to be used for analysis

- criteria include relevance to the data mining goals, quality and technical constraints such as limits on data volume or data types

- covers selection of attributes as well as selection of records in a table

Clean data

- raise the data quality to the level required by the selected analysis techniques

- may involve selection of clean subsets of the data, the insertion of suitable defaults or more ambitious techniques such as the estimation of missing data by modeling

Phase 3. Data Preparation

Construct data

- constructive data preparation operations such as the production of derived attributes, entire new records or transformed values for existing attributes

Integrate data

- methods whereby information is combined from multiple tables or records to create new records or values

Format data

- formatting transformations refer to primarily syntactic modifications made to the data that do not change its meaning, but might be required by the modeling tool

Phase 4. Modeling

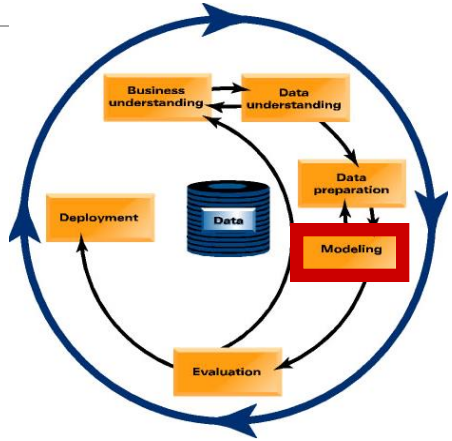
Select the modeling technique

(based upon the data mining objective)

Build model

(Parameter settings)

Assess model (rank the models)



Various modeling techniques are selected and applied and their parameters are calibrated to optimal values. Some techniques have specific requirements on the form of data. Therefore, **stepping back to the data preparation phase is often necessary**.

Phase 4. Modeling

Select modeling technique

- select the actual modeling technique that is to be used

ex) decision tree, neural network

- if multiple techniques are applied, perform this task for each techniques separately

Generate test design

- before actually building a model, generate a procedure or mechanism to test the model's quality and validity

ex) In classification, it is common to use error rates as quality measures for data mining models. Therefore, typically separate the dataset into train and test set, build the model on the train set and estimate its quality on the separate test set

Phase 4. Modeling

Build model

- run the modeling tool on the prepared dataset to create one or more models

Assess model

- interprets the models according to his domain knowledge, the data mining success criteria and the desired test design
- judges the success of the application of modeling and discovery techniques more technically
- contacts business analysts and domain experts later in order to discuss the data mining results in the business context
- only consider models whereas the evaluation phase also takes into account all other results that were produced in the course of the project

Phase 5. Evaluation

Evaluation of model

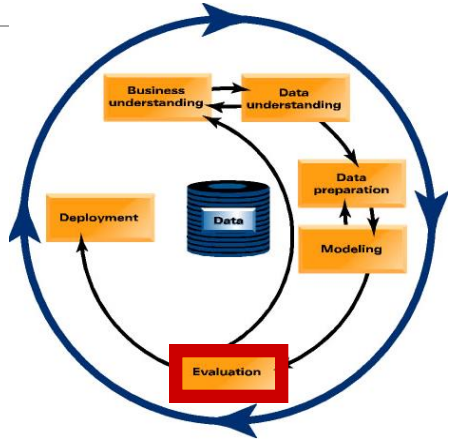
- how well it performed on test data

Methods and criteria

- depend on model type

Interpretation of model

- important or not, easy or hard depends on algorithm



Thoroughly evaluate the model and review the steps executed to construct the model to be certain it properly achieves the business objectives. A key objective is to determine if there is some important business issue that has not been sufficiently considered. At the end of this phase, a decision on the use of the data mining results should be reached

Phase 5. Evaluation

Evaluate results

- assesses the degree to which the model meets the business objectives
- seeks to determine if there is some business reason why this model is deficient
- test the model(s) on test applications in the real application if time and budget constraints permit
- also assesses other data mining results generated
- unveil additional challenges, information or hints for future directions

Phase 5. Evaluation

Review process

- do a more thorough review of the data mining engagement in order to determine if there is any important factor or task that has somehow been overlooked

- review the quality assurance issues

ex) “Did we correctly build the model?”

Determine next steps

- decides how to proceed at this stage

- decides whether to finish the project and move on to deployment if appropriate or whether to initiate further iterations or set up new data mining projects

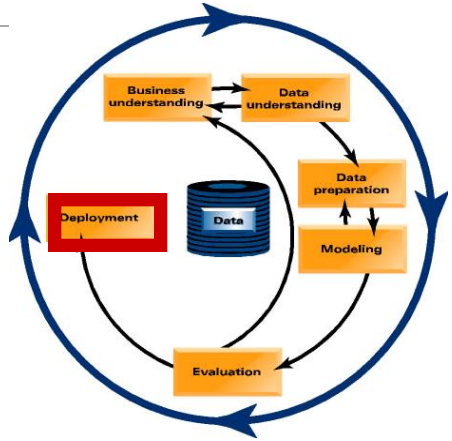
- include analyses of remaining resources and budget that influences the decisions

Phase 6. Deployment

Determine **how** the results need to be utilized

Who needs to use them?

How often do they need to be used



Deploy Data Mining results by

Scoring a database, utilizing results as business rules,

interactive scoring on-line

The knowledge gained will need to **be organized and presented in a way that the customer can use it**. However, **depending on the requirements**, the deployment phase can be as simple as generating a report or as complex as implementing a repeatable data mining process across the enterprise.

Phase 6. Deployment

Plan deployment

- in order to deploy the data mining result(s) into the business, takes the evaluation results and concludes a strategy for deployment

- document the procedure for later deployment

Plan monitoring and maintenance

- important if the data mining results become part of the day-to-day business and it environment

- helps to avoid unnecessarily long periods of incorrect usage of data mining results

- needs a detailed on monitoring process

- takes into account the specific type of deployment

Phase 6. Deployment

Produce final report

- the project leader and his team write up a final report
- may be only a summary of the project and its experiences
- may be a final and comprehensive presentation of the data mining result(s)

Review project

- assess what went right and what went wrong, what was done well and what needs to be improved

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Povzetek – zakaj CRISP-DM?

- **Proces** podatkovnega rudarjenja mora biti **zanesljiv** in **ponovljiv** (s strani ljudi z omejenim znanjem podatkovnega rudarjenja);
- CRISP-DM **zagotavlja enoten okvir** za:
  - smernice;
  - dokumentacijo primerov;
- CRISP-DM je **fleksibilen glede na razlike**:
  - različni (poslovni) problemi;
  - različni podatki;