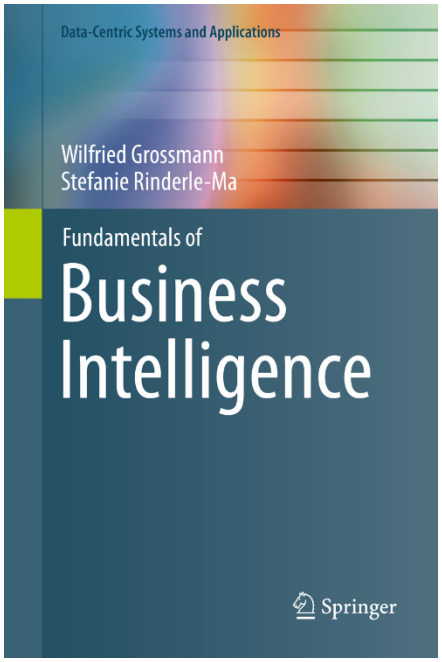


Chapter 1: Introduction

Contents

1 Definition of Business Intelligence

- Origin of the term Business Intelligence, coined by H.P.Luhn (IBM) in 1958[1]:
  - Intelligence as: „*the ability to apprehend the interrelationships of presented facts in such way as to guide action towards a desired goal*“
  - Business as: „*a collection of activities carried on for whatever purpose, be it science, technology, commerce, industry, law, government, defense, et cetera*.“
- Business Intelligence in the tradition of Decision Support Systems, close connection to Operations Research
- Methods applicable in many fields
- Focus on methods, similar to BI

[1]Luhn HP (1958) A business intelligence system. IBM Journal of Research and Development 2(4):314–319

1 Definition of Business Intelligence (BI)

- Change in focus due to availability of data
- H. Dresner (Gartner Group) re-coined the term BI in 1989:
  - Data Warehouse becomes the main topic of BI
  - OLAP und reporting are the dominant tools for decision support
  - Development of new methods for data analysis in computer science and statistics (Data Mining)
- Davenport postulates that BI is concerned with analysis, reporting, and BI software[2]
  - In this definition, business analytics is the subset of BI based on statistics, prediction, and optimization.

[2]Davenport TH (2006) Competing on analytics. Harvard Business Review 84(1)

Features of BI

- *Task of BI*: The main task of BI is providing decision support for specific goals defined in the context of business activities in different domain areas taking into account the organizational and institutional framework
- *Foundation of BI:* BI decision support mainly relies on empirical information based on data. Besides this empirical background, BI uses also different types of knowledge and theories for information generation
- *Realization of BI*: The decision support has to be realized as a system using the actual capabilities in information and communication technologies (ICT)
- *Delivery of BI*: A BI-system has to deliver information at the right time to the right people in an appropriate form

Actual Challenges

- Integration of improved process understanding, workflow considerations, and process mining
- Applications to new organizational structures
- New data sources (web data, semi-structured data, text data)
- New methods for new data types (text mining, opinion mining)
- Using actual IT facilities: SaaS, BigData (cloud)
- New devices: mobile devices, real time decision support

Topics Related to BI

- *Business Analytics*: Finding new insights and understanding of the business
- *CRM Analytics*: Focus on customers in order to improve relationship to customers
- *Predictive Analytics*: Main emphasis is on prediction of future business events by using statistically oriented models
- *Data mining*: Extracting information about the business from large data sets

Topics Related to BI

- *Machine Learning*: Computer programs with the ability to learn how to solve a task (AI); in its origin not so much oriented towards many data instance
- *Data Warehousing*: Organize all relevant data from operative systems and external systems under a unified view which supports information retrieval
- *Process Mining*: Finding structure in instances of business processes (more production-oriented)

Contents

Basic definitions:

- *Business* can be understood as any kind of activities of an organization for delivering goods or services to consumers
  - Size of business: Size of the enterprise, possible generalizations to similar enterprises or larger units
  - Scope of business: Complexity of the activities
- *Business strategy* describes how the organization intends to succeed
  - Depends on size of an organization and the scope of activities
- *Business model* reflects the strategy of an enterprise to create value
  - There are many other definitions of a business model

Business Intelligence Scenarios

– Roles of BI within a strategy and a business models

- Business Intelligence separated from strategic management
- Business Intelligence supports monitoring of strategy performance
- Business Intelligence as feedback on strategy formulation
- Business Intelligence as strategic resource

Business Intelligence perspectives

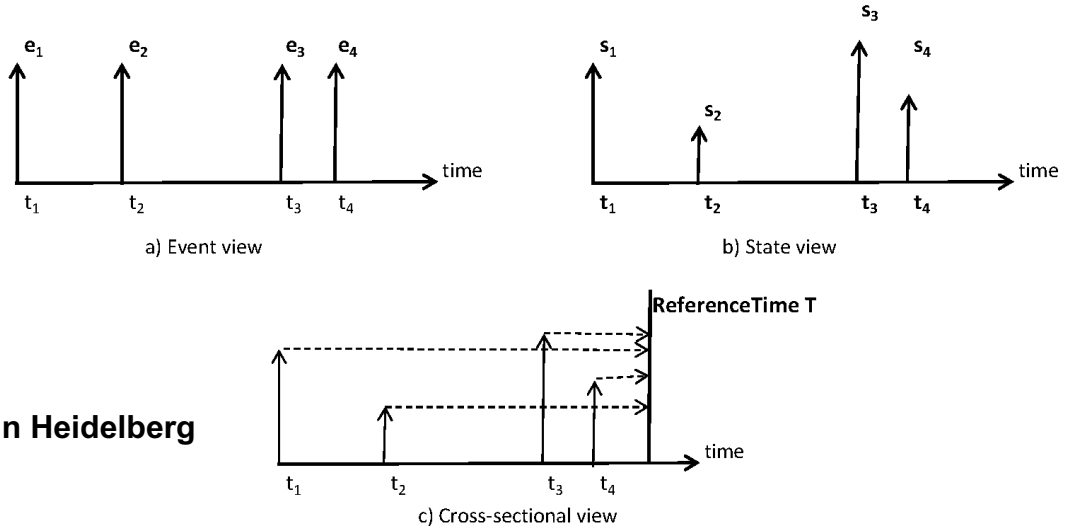
- Business activities are frequently structured by formulating a business process
- *Business process*: A collection of related and structured activities necessary for delivering a certain good or service to customers together with possible response activities of customers
- *Process instances*: observable realization of the business process
- Three different perspectives of business processes:
  - *Production perspective*: What should be offered to customers? How should the offer be produced?
  - *Customer perspective*: How do customers perceive the product? How do customers react?
  - *Organizational perspective*: What organizational structure is behind production? What organizational structure is behind customers?

Business Intelligence perspectives (ctd.)

– In connection with the organizational perspective it is often important to identify roles of involved parties:
  - *Process owner*: Responsible for setting up the rules behind the process
  - *Process subjects*: Identifiers for the process instances
  - *Process actors*: Other persons or organizational units involved in the process execution

Business Intelligence views

- The business process can be viewed from different angles
  - *Event view*: Main emphasis is on the events in the business process
    - Activities are characterized by a start event, an end event, and possibly interruption and resuming events
  - *State view*: In connection with events frequently attributes are measured which characterize the state of the process at a certain time
  - *Cross-sectional view*: Look at the history of many process instances at a certain time
- Schematic representation of the views:



Business Intelligence goals

- Main goal of Business Intelligence is to give information about the performance and to improve the performance of a business process
- Measurement of performance by Key Performance Indicators (KPI)
- Influential factor: Attributes of the process that influence the performance
- KPIs are designed for information about the business process
- If we are interested in improvement of the business process we need reformulation of the relation between KPIs and influential factors in terms of analytical goals

Business Intelligence goals

- Typology of Analytical Goals
  - *Descriptive goals*
    - Reporting (KPIs)
    - Segmentation (Clustering)
    - Detecting interesting behavior
  - *Predictive goals*
    - Regression: Find a model for the relationship between KPI and influential factors
    - Classification: Find rules which allow assignment of observed process instances to one of the possible classes
  - *Understanding goals*
    - Process identification: Finding rules which determine the relationships between the events of the process
    - Process analysis: investigate the conformance of process instance with a defined process

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3 Tasks and analysis formats

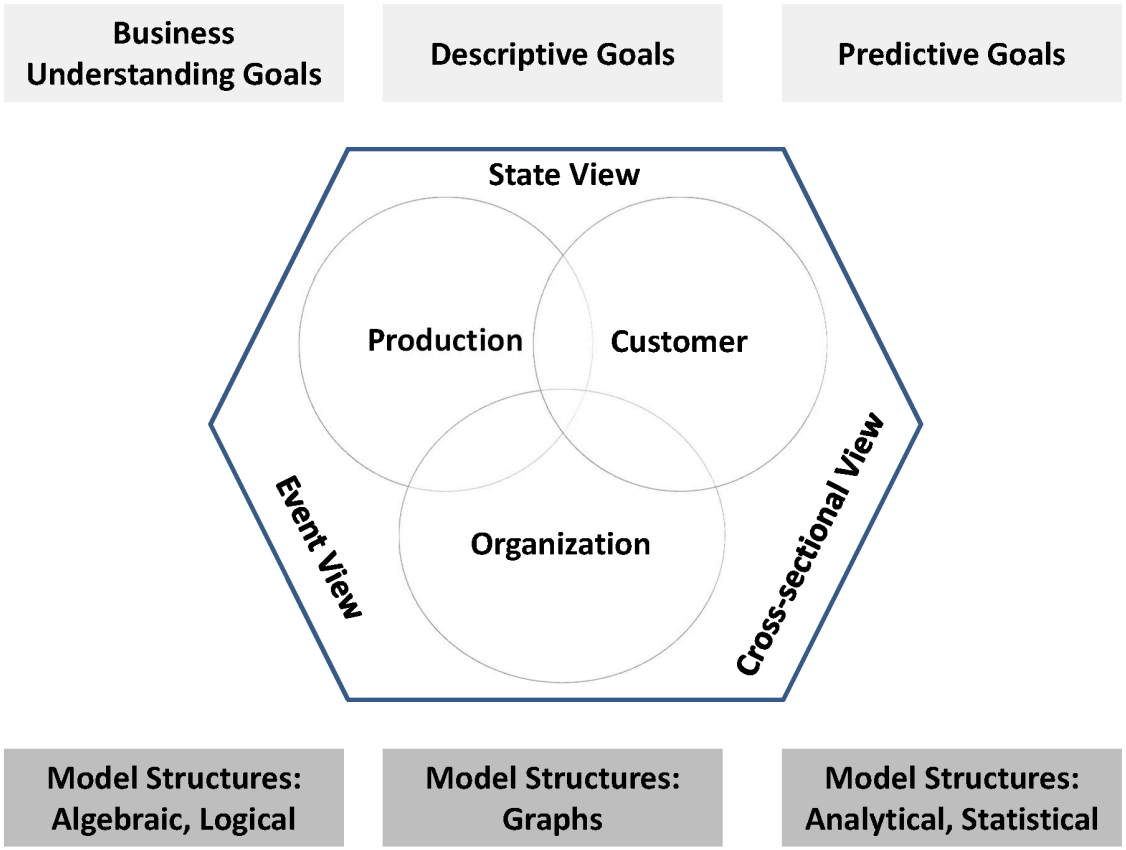
For achievement of the analytical goals we must execute a number of analysis tasks

- *Data Task*: Organization of the available information about the business and its environment
  - The data task is based on data modeling techniques (ER-models, UML, semi-structured data)
  - Main challenge is integration of data from different sources and data quality
- *Business and Data Understanding Ta*sk: Looking at the business from the intended goals (KPIs) point of view; activities:
  - Explore application environment (size and scope of business, BI strategy, resources for and time horizon of the BI-project)
  - Which business perspective is of main interest?
  - Which view on the process is supported by data
  - How can KPIs and analytical goals be formulated?
  - Assessment of data

For achievement of the analytical goals we must execute a number of analysis tasks (ctd.)

- *Modeling Task*: Define an analytical model, which allows formulation of the analytical goals in terms of certain properties of the model
  - Usually different models have to be explored
  - Choice of models have to take into account
    - The analytical goal
    - The business perspective we are interested in
    - The view on the business defined by the data
  - The more techniques one knows the better one can fit these criteria

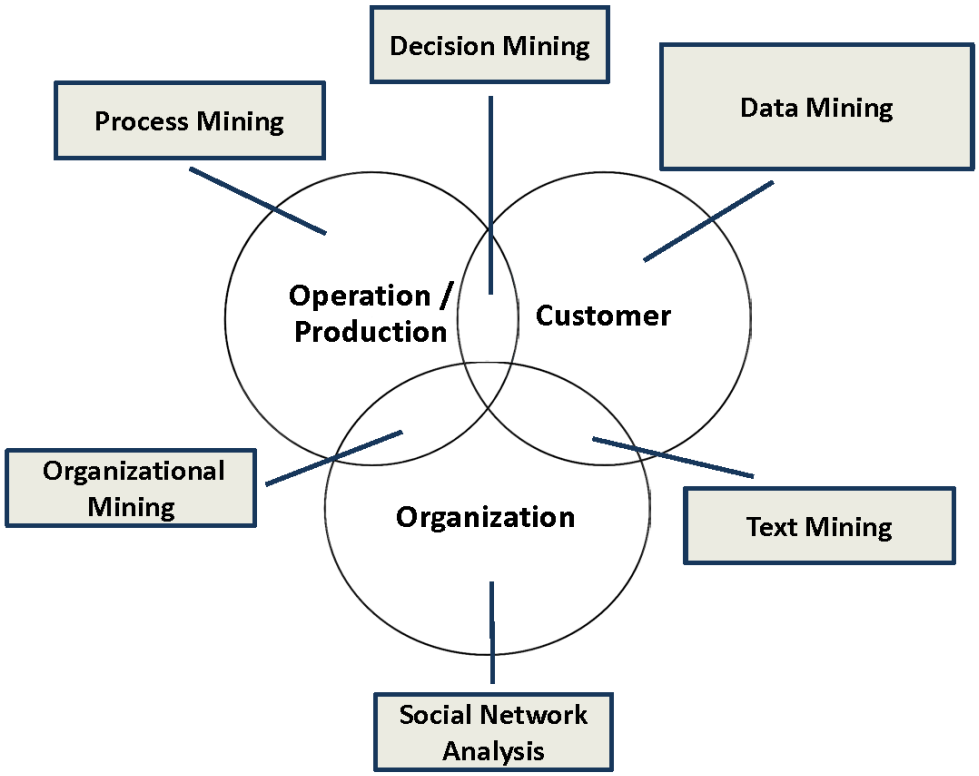
– Overview on modeling activities



For achievement of the analytical goals we must execute a number of analysis tasks (ctd.)

– *Analysis Task*: Apply analytical (algorithmic) techniques which answer the questions of the analytical goals in the framework of the model
  - In context of BI applications these analytical techniques are often called “mining”
    - Other terms: Data Analytics, Machine Learning
  - Different mining techniques have been established in connection with the different business perspectives

– Overview about mining techniques and business perspectives



For achievement of the analytical goals we must execute a number of analysis tasks (ctd.)

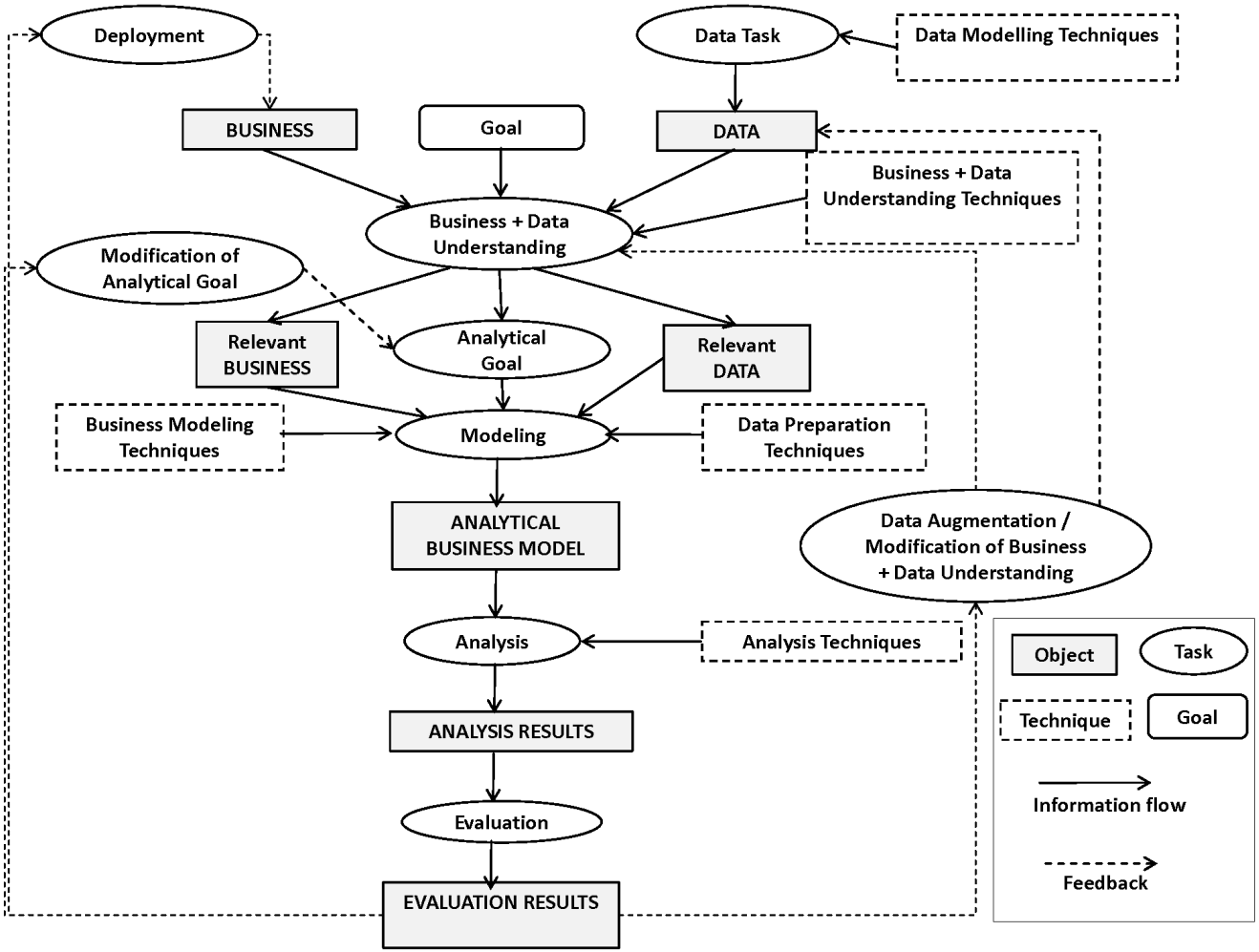
- Evaluation and Reporting Task: Present the results of the analysis in context of the business
  - Evaluation and reporting has to be done under consideration of the intended audience
  - Focus on the main points
  - Use visualization techniques

3 Tasks and analysis formats

- Analysis Formats put the different analysis tasks into a coherent framework
- Some examples of analysis formats:
  - Software engineering projects: cascade models or cyclic models
  - Data mining projects: Cross Industry Standard Process for Data Mining (CRISP): Focus on analysis of data in the cross-sectional view
  - L*-Format: Focus on process mining applications for data in the event view
  - iMine: Combining ideas of CRISP and L*

3 Tasks and analysis formats

iMine format, combining CRIPS and L*



Contents

4 Use cases

General template

Use Case Description Template

- Business Case:
- Goals:
- Data Task:

Business and Data Understanding Template

- Application Environment:
- Business Perspectives:
- BI Views:
- Analytical Goals:
- Assessment of Data:

Contents

5 Summary and outlook

Overview on the following sections:

- Section 2: modeling task in BI applications
- Section 3: overview and details on the data provisioning task
- Section 4: data description, visualization, and reporting
- Section 5: data mining techniques for cross-sectional data
- Section 6: techniques for the analysis of temporal data
- Section 7: techniques for the analysis of process data
- Section 8: analysis techniques for multiple BI perspectives
- Section 9: summary and discussion

5 Summary & outlook