IEGULDĪJUMS TAVĀ NĀKOTNĒ

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Performance Measurement Framework with Indicator Life-Cycle Support

Aivars Niedritis, Janis Zuters, Laila Niedrite

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Outline

- Key concepts
- Five-step lifecycle of indicators
- Architecture of Performance Measurement System
- Integration with Data Warehouse Components
- Conclusions and future work

Key concepts (I)

- *Performance measures* refer to indicators used by management to measure, report and improve the performance in an organization.
- Performance measures are classified as:
  - result indicators,
  - key result indicators,
  - performance indicators,
  - key performance indicators

Key concepts (II)

- In the measurement, the following hierarchical structure is considered:
  - attributes → base measures → derived measures → indicators → information.
  - *An indicator* is a measure that ensures the evaluation for particular attributes and is gained by means of an analysis which is performed according to an analysis model.
  - Analysis model is an algorithm that combines two or more base and/or derived measures with decision criteria.
  - Indicators provide the basis for a decision making and supply analysts with the necessary *information*.

Key concepts (III)

- The definition of appropriate performance measures should be performed in a systemic way, based on well known approaches
- The set of used performance measures is influenced by *management models* of organizations and *measurement perspectives* defined within these models.
  - e.g. Balanced Scorecard (BSC),
    - four measurement perspectives are defined: Financial, Customer, Internal Process, and Learning and Growth.
  - two more perspectives :
    - Environment/Community and Employee Satisfaction

Features of Indicators

- *Perspectives*
  - not all indicator types cover all perspectives, e.g. financial perspective is related to KRIs and RIs, but not to PIs.
- *Time*
  - measurement periods , reporting periods
- *Responsibility*
  - Persons responsible for different types of performance measures could be at different levels starting from the top management to an individual level,
- *Activities*
  - RIs cannot be tied to a discrete activity; PIs, on the contrary, are tied to a discrete activity.
- *Reporting*
  - Responsibility aspect and Reporting aspect not always have the same meaning.
- Others…

Goal of the research

- Development of performance measurement framework with systematized features of indicators.
- Proposed framework:
  - covers five-step indicator lifecycle
  - exploits features and components of data warehouses

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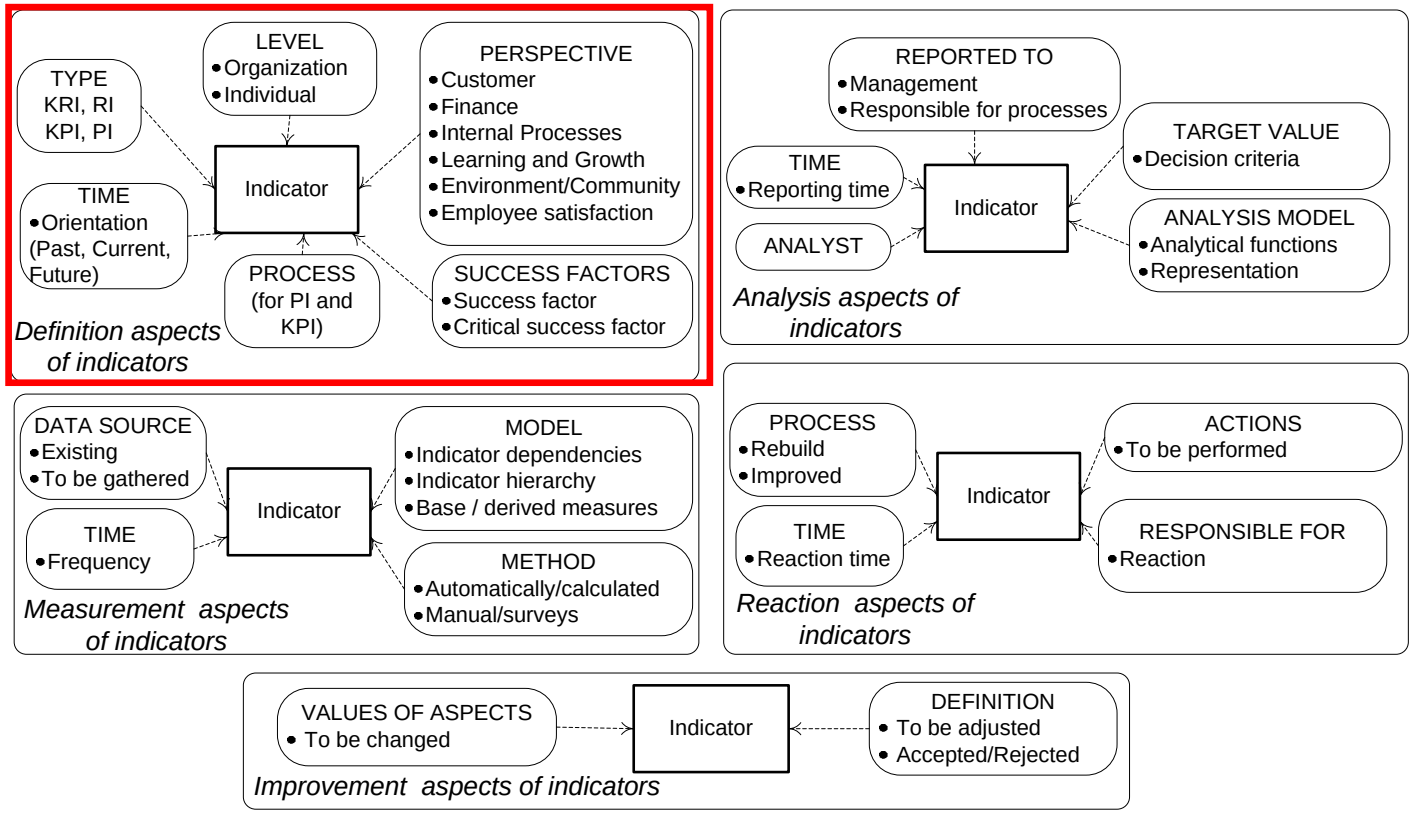
Five-step lifecycle of indicators

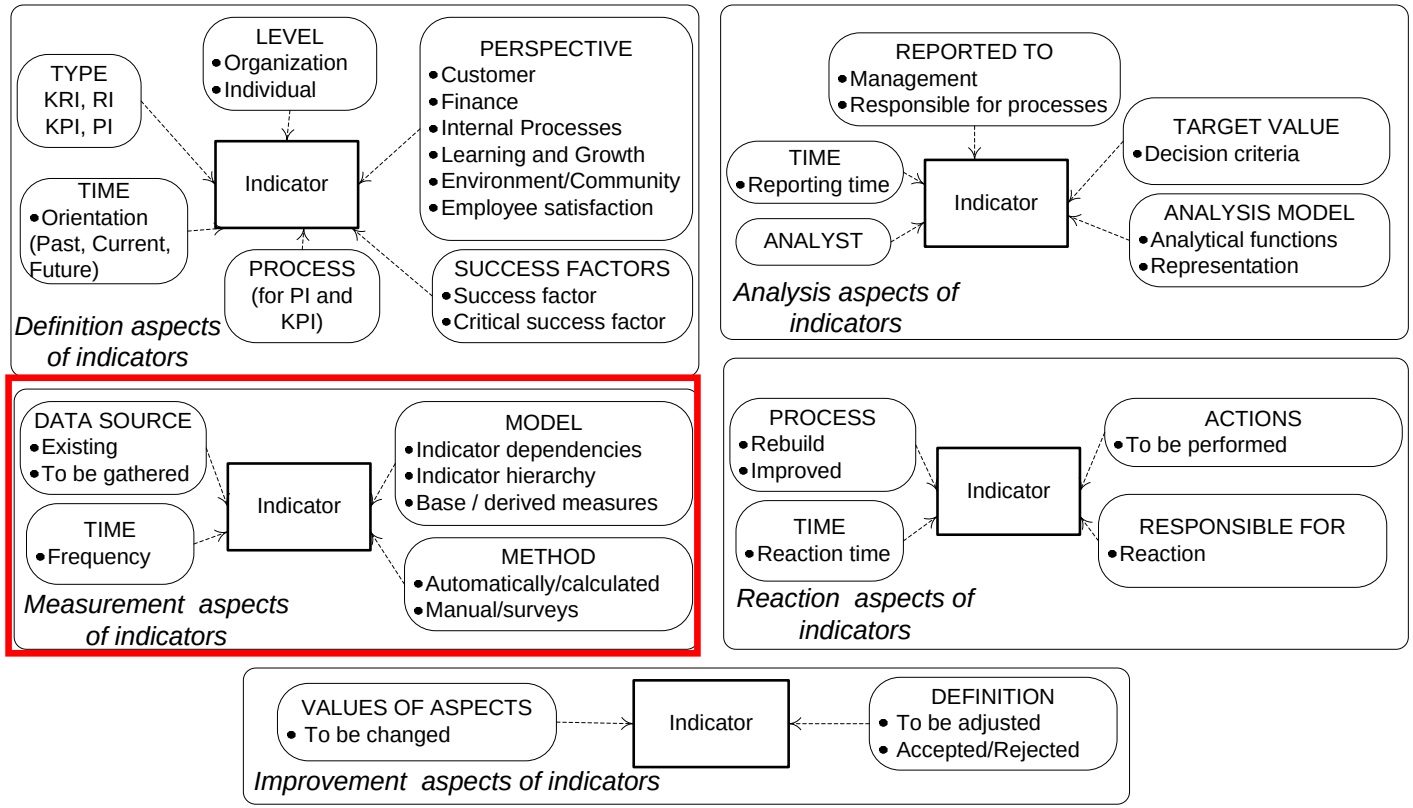
- Definition
  - Indicator definition step describes mostly different features of indicators that help to understand why that measure is introduced.



Five-step lifecycle of indicators

– Measurement

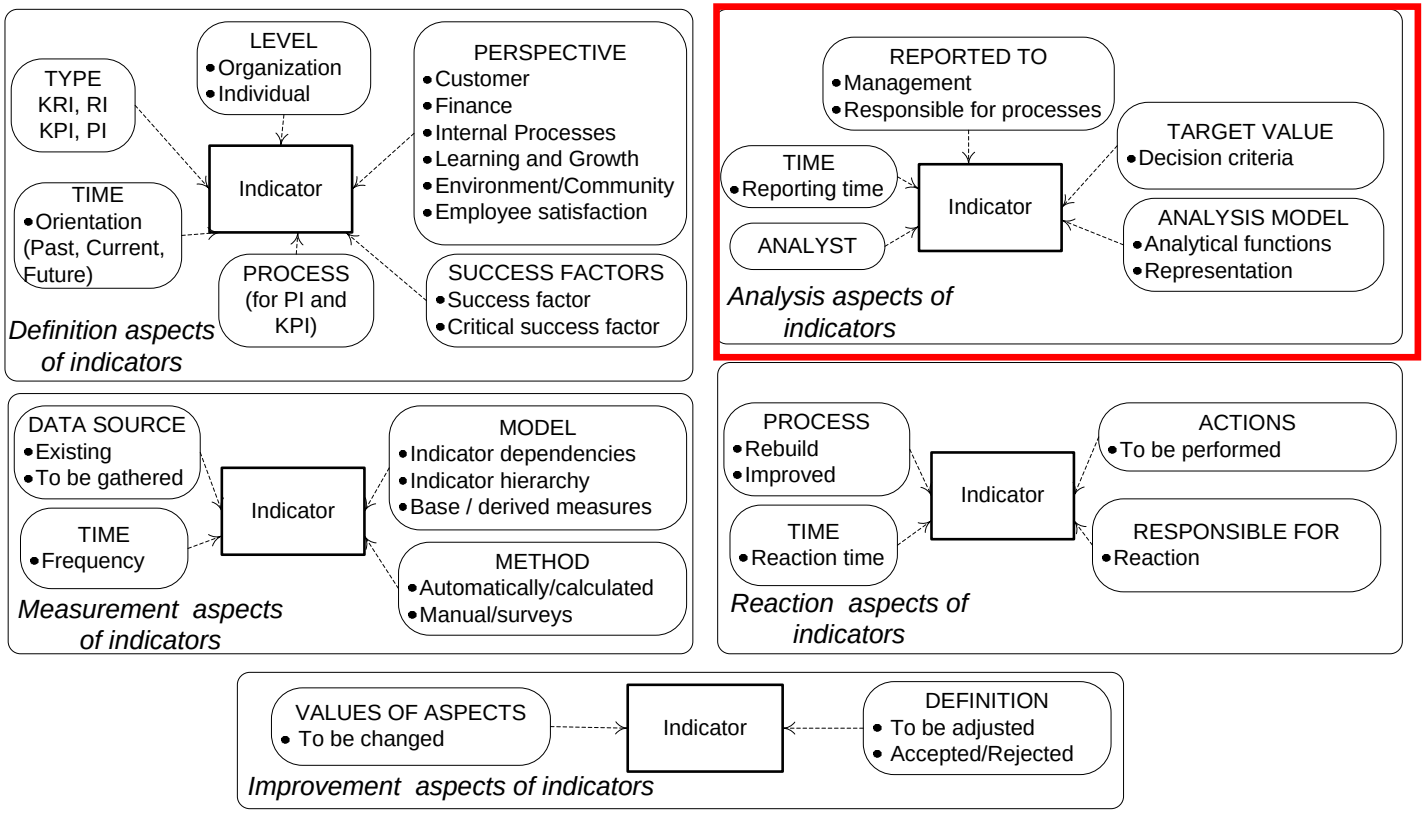
- The measurement step represents the process, when indicators get the values.



Five-step lifecycle of indicators

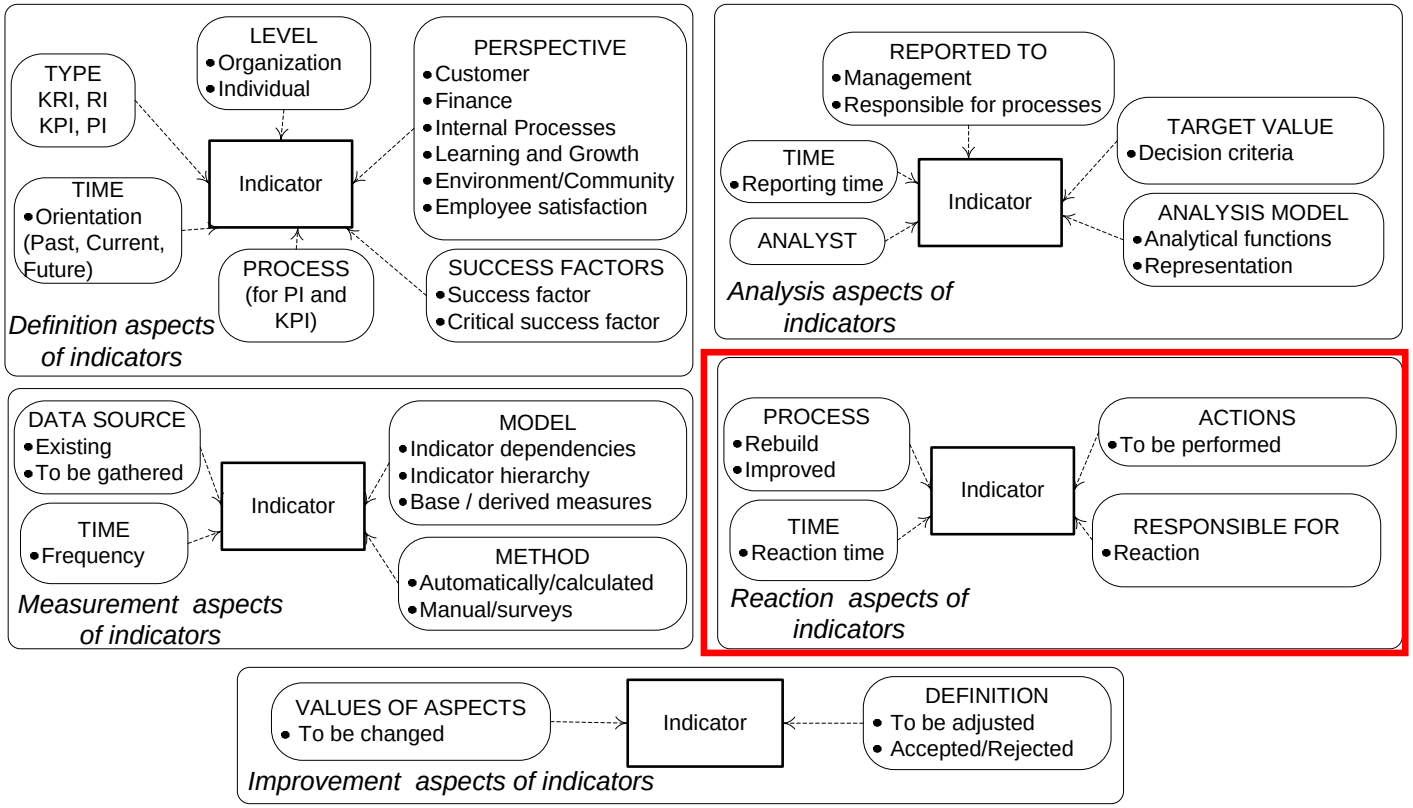
– Analysis

- The analysis step represents the process, when indicators are used to make decisions.



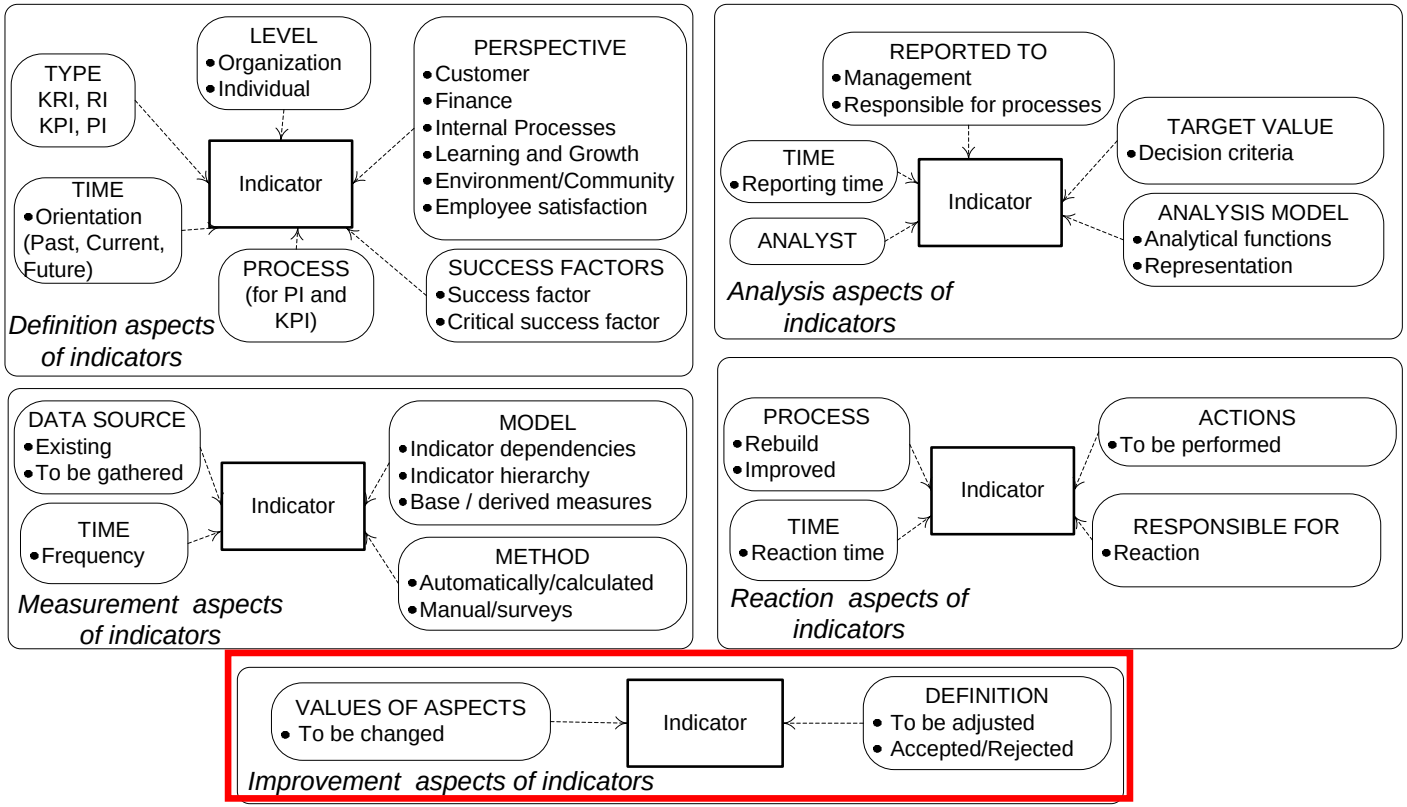
Five-step lifecycle of indicators

- Reaction
  - The reaction step represents the process, when the decisions that are made in the previous step are implemented.



Five-step lifecycle of indicators

- Improvement
  - The improvement step supports the evaluation of indicator definitions and values of aspects.



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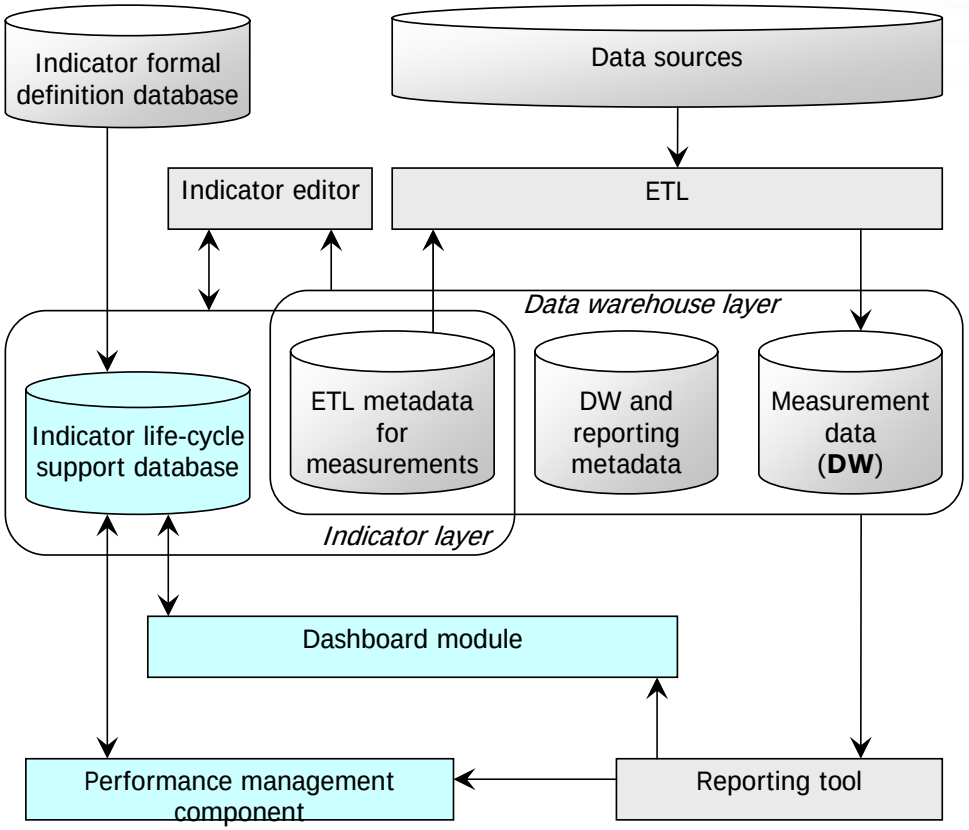
Architecture of Performance Measurement System

- Based on existing data warehouse technologies.
- The proposed system is grounded on the following principles of design and operation:
  - Processing of indicator information is performed in conformance with the life-cycle of indicators and formal indicator metamodel
  - Measurement data are obtained through an Extract, Transform, Load (ETL) process and stored in a data warehouse;
  - Indicator analysis aspect is provided by using a ready-made data warehouse reporting tool

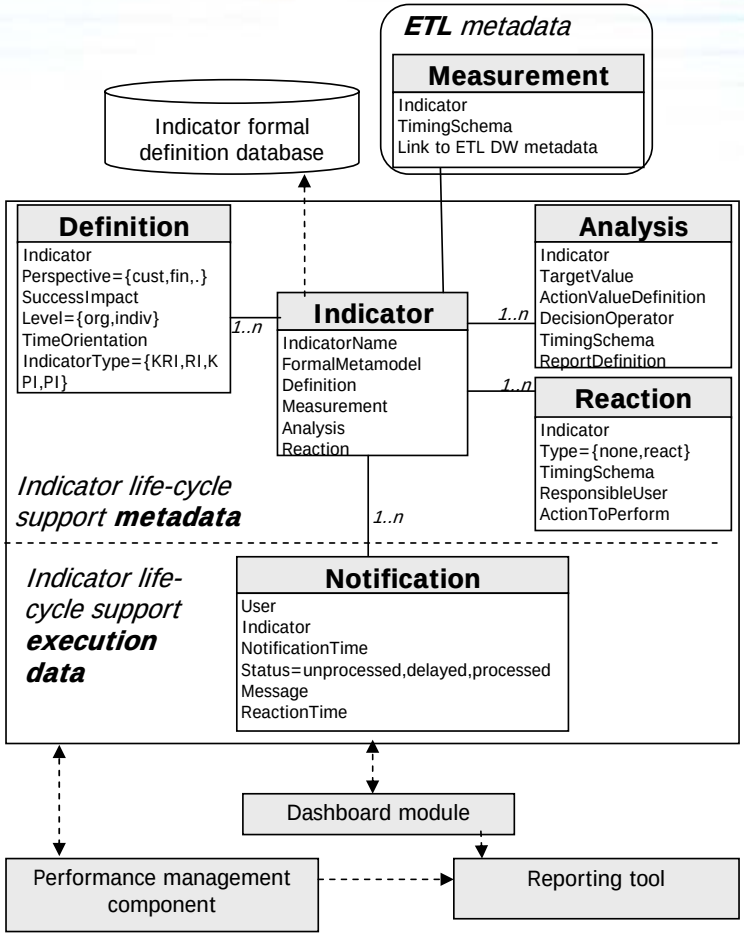
Architecture of Performance Measurement System

- The kernel of system:
  - performance management component
  - the indicator life-cycle support database
  - dashboard module.



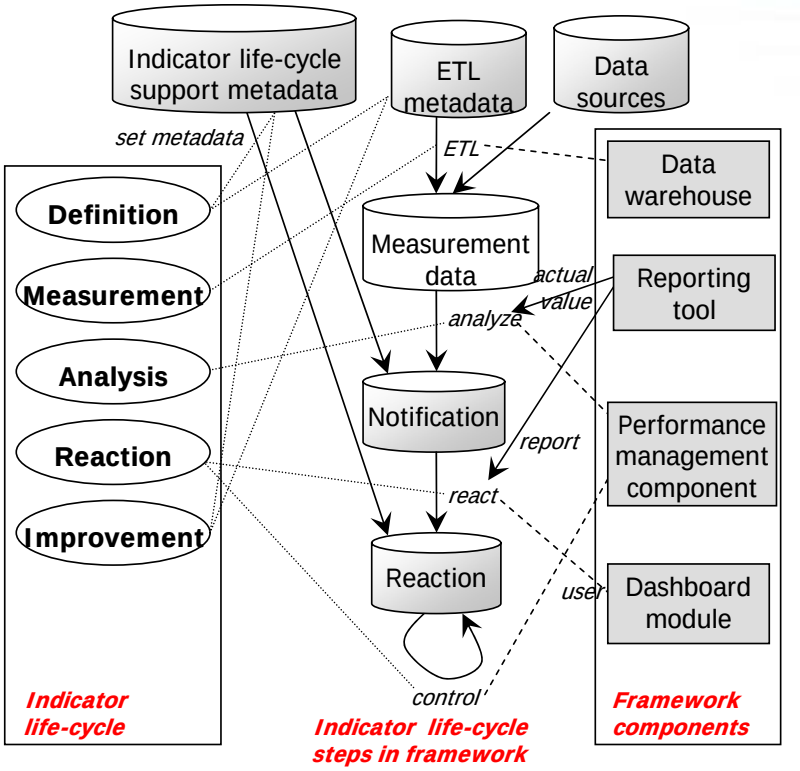
Indicator Life-Cycle Support Database

- *'Indicator life-cycle support metadata'* define the behavior of the framework
- metadata are used by *'Performance management component'* to coordinate the workflow of the indicator life-cycle
- measurement is fully assigned to the data warehouse
- Workflow status is stored in the '*Indicator life-cycle support execution data*'
  - is accessible by users via 'Dashboard module'.



Indicator Life-Cycle Steps in Performance Measurement Framework

- **Measurement step** is performed by an **ETL** process of the data warehouse
- In **analysis step** measurement data are processed according to indicator life-cycle support metadata by the Performance management component
  - Reporting tool is used to obtain the actual value of the indicator.
  - Record is added to the indicator life-cycle execution data;
  - The information about the performed measurements of indicators in form of a notification becomes visible to appropriate users in a special dashboard.



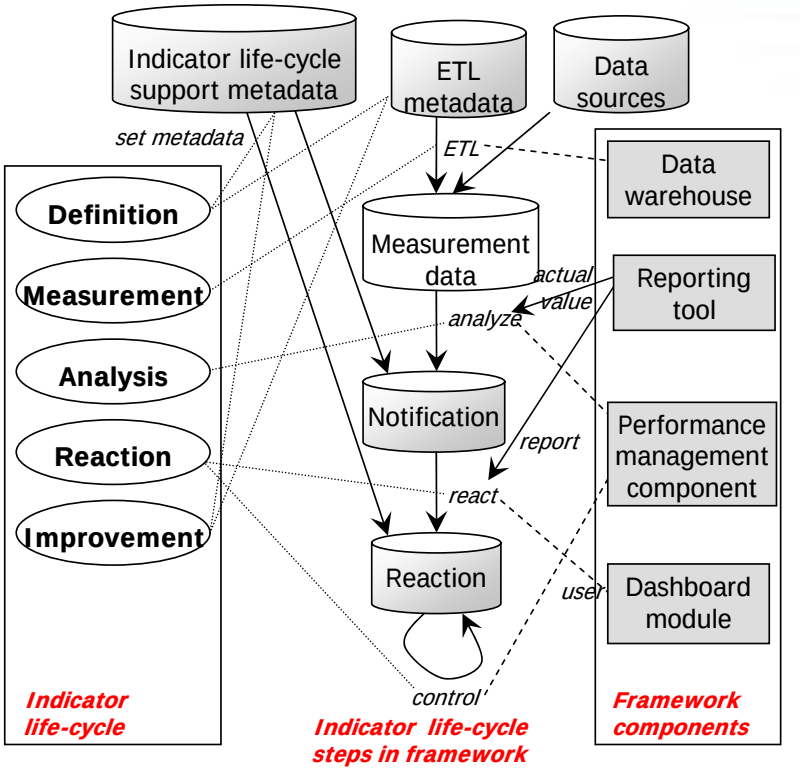
Mapping between Indicator life-cycle and Performance measurement framework

Method as part of the framework component

Indicator data flow

Indicator Life-Cycle Steps in Performance Measurement Framework

- User's **reaction** is obtained from the Dashboard module and can be of two types:
  - A request for the detailed notification. Reporting tool is used here to obtain a report that describes the actual measurement in detail;
  - If the description of an indicator provides for a <u>response</u> to the notification, user is required to assert this in time and in a special way.
- In **control** activity Performance management component checks whether users have responded to the notifications, if such reactions were predefined in metadata



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Integration with Data Warehouse Components: ETL (Extract, Transform, Load)

- ETL metadata for measurements (*Measurement* class) is a part of Indicator life-cycle support database
- The *Indicator* attribute identifies a particular attribute that is measured,
- *TimingSchema* attribute describes the time parameters of measurement (e.g. frequency, exact starting time).
- *ETLprocess attribute* – points to the data warehouse meatadata repository:
  - metadata that describes mappings between the source and data warehouse schemas.
  - metadata also contains calls to corresponding procedures that implement these mappings

Integration with Data Warehouse Components: Reports

- *Analysis* class of Indicator life-cycle support database:
  - *ReportDefinition* attribute is a pointer to the report definition stored in accordance to the metamodel of the reporting tool.
  - Reporting metadata of reporting tool:
    - contain the *Worksheet* class that identifies a particular report that can be invoked when analysis of measurement results is performed.
    - The report can be simple, when one particular value is retrieved to compare it with a target value,
    - The report can be complex, when the report is used for the detailed analysis

Conclusions and Future work

- The proposed Performance measurement framework has been designed to obtain the maximum benefits from matured data warehouses technologies in implementing indicator life-cycle support.
- The applied model of indicator life-cycle serves as a theoretical means of quality assurance for the performance measurement.
- The use of data warehouses as integral part of the framework covers two important aspects of ensuring the indicator life-cycle: (a) indicator measurement, and (b) part of indicator analysis (performed by Reporting module).
- The provided method for performance measurement ensures timely and to given context appropriate decision making process:
  - The indicator life-cycle support database stores metadata that define and schedule the measurement and control processes of indicators, including timing schemas, responsibilities and actions to be performed.
  - The proposed framework provides the option to build performance control on the activities initiated from the side of the measurement system, as soon as the system recognizes the problem
- Preliminary works of implementing the framework are already in progress, so we expect the first experimental results in the near future

Thank you!