Performance Measurement Framework with Indicator Life-Cycle Support

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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*. 
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 KRIIs and RIIs, but not to PIIs.

- **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; PIIs, 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
The kernel of the system:

- performance management component
- the indicator life-cycle support database
- dashboard module.
‘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.
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 **response** 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 metadata 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!