

Data Warehouse (DW) Maturity Assessment Questionnaire

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The DW Maturity Assessment Questionnaire

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This technical report presents the data warehouse (DW) maturity assessment questionnaire developed by (Sacu et al., 2010) as part of the DW Capability Maturity Model. The main goal of the questionnaire is to help organizations make a high level assessment of the maturity of their DW solution.

Emphasis should be put on two aspects regarding the DW maturity assessment questionnaire. Firstly, it does a *high level assessment of an organization's DW solution* and it is *limited strictly to the DW technical aspects*. Secondly, the model will assess “*what*” and “*if*” certain characteristics and processes are implemented and not “*how*” they are implemented. The DW maturity assessment questionnaire has 60 questions divided into the following three categories:

- *DW General Questions* (9 questions) – it comprises of several questions about the DW/BI solution and they are not scored. Their purpose is to offer a better image on the drivers for implementing the DW environment, the budget allocated for data warehousing and BI, the DW business value, end-user adoption, etc. This will be useful in creating a complete picture on the current DW solution and its maturity. Also, once the questionnaire is filled in by more organizations, this data will serve as input for statistical analysis and comparisons between organizations from the same industry or across industries.
- *DW Technical Solution* (32 questions) – it comprises of several scored questions for each of the following sub-categories:
 - General Architecture and Infrastructure (9 questions)
 - Data Modelling (9 questions)
 - ETL (7 questions)
 - BI Applications (7 questions). More details on this part will be given in the next sections.
- *DW Organization & Processes* (19 questions) – it comprises of several scored questions for each of the following sub-categories:
 - Development Processes (11 questions)
 - Service Processes (8 questions). More details on this part will be given in the next sections.

Each question from the questionnaire will have five possible answers which are scored from 1 to 5, 1 being a characteristic for the lowest maturity stage and 5 for the highest one. When an organization takes the survey, it will first receive a *maturity score for each sub-category* by computing the average value of the weightings (i.e.: sum of the weightings / number of questions); then, *an overall score for each of the two main categories* will be given by computing the average value of the scores obtained for each sub-category; and finally, *an overall maturity score* is shown following the same principle applied to the main two categories scores.

We believe that the *maturity scores for the sub-categories* can give a good overview on the current DW solution implemented by the organization. This is the reason why, after computing the maturity scores for each sub-category, a radar graph as the one depicted in figure 1 will be drawn to show the alignment between these scores. In this way, the organization will have a clearer image on their current DW project and will know what sub-category is the strongest and which one is left behind.

Moreover, after reviewing the maturity scores and the given answers by a specific organization, some *general feedback and advice for future improvements* will be provided. Each organization that takes the assessment will receive a document with a short explanation on the scoring method, a table with their maturity scores and the radar graph, and then some general feedback that will consist of: a general overview on the maturity scores; an analysis of the positive aspects already implemented in the DW solution; and several steps that the organization should take in order to improve their current DW application. The whole DW maturity assessment questionnaire can be seen further in this report. A preliminary version of this research has been published in (Sacu et al., 2010).

Data Warehouse (DW) Maturity Assessment Questionnaire

The filling in of the questionnaire will take approximately 50 minutes and in the end a maturity score for each benchmark category/sub-category and an overall maturity score will be provided. The questions from the first part of the questionnaire (i.e.: DW General Questions) are not scored and their answers will serve as input for shaping a better image of the DW solution maturity. The questions from the second and third part of the questionnaire (i.e.: DW technical solution; and DW organization and processes) are scored from 1 to 5 and they are multiple choice questions with only one possible answer (except questions 3.1 – 11 and 3.2 – 1 where more answers may be circled).

1 DW General Questions

- 1) Could you elaborate on the main drivers for implementing a BI/DW solution in your organization?
- 2) How long has your organization been using BI/DW?
- 3) Could you elaborate on the success of the BI/DW solution in your organization, in terms of:
 - a) Returns vs. Costs
 - b) Time (Intended vs. Actual)
 - c) Quality
 - d) End-user adoption.
- 4) Which answer best describes how executives perceive the purpose of your organization's BI/DW environment?
 - a) Operational cost center – An IT system needed to run the business
 - b) Tactical resource - Tools to assist decision making
 - c) Mission-critical resource - A system that is critical to running business operations
 - d) Strategic resource – Key to achieving performance objectives and goals
 - e) Competitive differentiator – Key to gaining or keeping customers and/or market share.
- 5) What percentage of the annual IT budget for your organization does the BI/DW budget represent?
- 6) What percentage of the IT department is taking care of BI (i.e.: how many people from the total number of IT employees)?
- 7) Who is the budget owner of the BI/DW solution in your organization (i.e.: who is responsible for paying the invoice)?
- 8) Which technologies do you use for developing the BI/DW solution in your organization?

| Developing Category | Technology |
|------------------------------|------------|
| Data Modelling | |
| Extract/Transform/Load (ETL) | |
| BI Applications | |
| Database | |

- 9) What data modelling technique do you use for your BI/DW solution (e.g.: dimensional modelling, normalized modelling, data vault, etc.)?

2 DW Technical Solution

2.1 General Architecture and Infrastructure

- 1) What is the predominant architecture of your DW?
 - a) Multiple independent data marts
 - b) A virtual integrated DW or real-time DW
 - c) Multiple independent data warehouses
 - d) A single, central DW with multiple data marts (Inmon) or conformed data marts (Kimball)
 - e) Desktop data marts (e.g.: Excel sheets)

- 2) To what degree have you defined and documented definitions and business rules for the necessary transformations, key terms and metrics?
 - a) No business rules defined
 - b) Most of the business rules defined and documented
 - c) Few business rules defined and documented
 - d) All business rules defined and documented
 - e) Some business rules defined and documented

- 3) To what degree have you implemented definitions and business rules for the necessary transformations, key terms and metrics?
 - a) No business rules implemented
 - b) Most of the business rules implemented
 - c) Few business rules implemented
 - d) All business rules implemented
 - e) Some business rules implemented

- 4) To what degree is your metadata management implemented?
 - a) Web-accessed central metadata repository with integrated, standardized, up-to-date metadata
 - b) Non-integrated metadata by solution
 - c) Central up-to-date metadata repository
 - d) No metadata management
 - e) Central metadata repository separated by tools

- 5) To what degree is security implemented in your DW architecture?

- a) No security implemented
 - b) Integrated company wide security
 - c) Independent authorization for each tool
 - d) Authentication security
 - e) Role-level security at database level
- 6) What types of data sources does your DW support at the highest level?
- a) CSVs files
 - b) Operational databases
 - c) ERP and CRM systems; XML files
 - d) Unstructured data sources (e.g.: text or documents)
 - e) Various types of unstructured data sources (e.g.: images, videos) and Web data sources
- 7) To what degree do you use methods to increase the performance of your DW?
- a) Specialized DW appliances (e.g.: Netezza, Teradata) or cloud computing
 - b) No methods to increase performance
 - c) Software performance tuning (e.g.: index management, parallelizing and partitioning system, views materialization)
 - d) Hardware performance tuning (e.g.: DW server)
 - e) Software and hardware tuning
- 8) To what degree is your infrastructure specialized for a DW?
- a) Desktop platform
 - b) Specialized DW appliances (e.g.: Netezza, Teradata)
 - c) Separate OLTP systems and DW environment
 - d) Separate servers for OLTP systems, DW, ETL and BI applications
 - e) Shared OLTP systems and DW environment
- 9) Which answer best describes the update frequency for your DW?
- a) Daily update
 - b) Monthly update or less often
 - c) Real-time update
 - d) Inter-daily update
 - e) Weekly update

2.2 Data Modelling

- 1) Which answer best describes the usage of a data modelling tool in your organization?
- a) No data modelling tool
 - b) Scattered data modelling tools used only for design
 - c) Standardized data modelling tool used for design and maintaining metadata
 - d) Standardized data modelling tool used only for design
 - e) Scattered data modelling tools used also for maintenance
- 2) Which answer best describes the degree of synchronization between the following data models that your organization maintains and the mapping between them: ETL source and target models; DW and data marts models; BI semantic or query object models?
- a) Automatic synchronization of all of the data models
 - b) Manual synchronization of some of the data models

- c) No synchronization between data models
 - d) Manual or automatic synchronization depending on the data models
 - e) Automatic synchronization of most of the data models
- 3) To what degree do you differentiate between data models levels: physical, logical and conceptual?
- a) No differentiation between data models levels
 - b) All data models have conceptual, logical and physical levels designed
 - c) Logical and physical levels designed for some data models
 - d) Conceptual level also designed for some data models
 - e) Logical and physical levels designed for all the data models
- 4) To what degree have you defined and documented standards (e.g.: naming conventions, metadata, etc.) for your data models?
- a) No standards defined for data models
 - b) Enterprise-wide standards defined for some of the data models
 - c) Enterprise-wide standards defined for most of the data models
 - d) Solution-dependent standards defined for some of the data models
 - e) Enterprise-wide standards defined for all the data models
- 5) To what degree have you implemented standards (e.g.: naming conventions, metadata, etc.) for your data models?
- a) No standards implemented for data models
 - b) Enterprise-wide standards implemented for some of the data models
 - c) Enterprise-wide standards implemented for most of the data models
 - d) Solution-dependent standards implemented for some of the data models
 - e) Enterprise-wide standards implemented for all the data models
- 6) To what degree have you documented the metadata (e.g.: definitions, business rules, main values, data quality, etc.) in your data models?
- a) No documentation for any data models
 - b) Standardized documentation for some of the data models
 - c) Standardized documentation for all the data models
 - d) Non standardized documentation for some of the data models
 - e) Standardized documentation for most of the data models
- If you use dimensional modelling, please answer the following three questions:
- 7) What percentage of all your fact tables has their granularity at the lowest level possible?
- a) Very few fact tables have their granularity at the lowest level possible
 - b) Few fact tables have their granularity at the lowest level possible
 - c) Some fact tables have their granularity at the lowest level possible
 - d) Most fact tables have their granularity at the lowest level possible
 - e) All fact tables have their granularity at the lowest level possible
- 8) To what degree do you design conformed dimensions in your data models?
- a) No conformed dimensions
 - b) Conformed dimensions for few business processes
 - c) Enterprise-wide standardized conformed dimensions for most business processes; also making use of a high level design technique such as an enterprise bus matrix

- d) Conformed dimensions for some business processes
 - e) Enterprise-wide standardized conformed dimensions for all business processes
- 9) Which answer best describes the current state of your dimension tables modelling?
- a) Few dimensions designed; no hierarchies or surrogate keys designed
 - b) Some dimensions designed with surrogate keys and basic hierarchies (if needed)
 - c) Most dimensions designed with surrogate keys and basic/complex hierarchies (if needed)
 - d) Slowly changing dimensions techniques (i.e.: type 2, 3 and more) also designed
 - e) Besides regular dimensions, special dimensions are also designed (e.g.: mini, monster, junk dimensions)

2.3 ETL

- 1) Which answer best describes the usage of an ETL tool in your organization?
- a) Only hand-coded ETL
 - b) Complete ETL generated from metadata
 - c) Hand-coded ETL and some standard scripts
 - d) Standardized ETL tool and some standard scripts
 - e) ETL tool(s) for all the ETL design and generation
- 2) Which answer best describes the complexity of your ETL?
- a) Simple ETL that just extracts and loads data into the data warehouse
 - b) Basic ETL with simple transformations such as: format changes, sorting, filtering, joining, deriving new calculated values, aggregation, etc and surrogate key generator
 - c) Advanced ETL capabilities: slowly changing dimensions manager, reusability, change data capture system, de-duplication and matching system, data quality system
 - d) More advanced ETL capabilities: error event table creation, audit dimension creation, late arriving data handler, hierarchy manager, special dimensions manager
 - e) Optimized ETL for a real time DW (real-time ETL capabilities)
- 3) Which answer best describes the data quality system implemented for your ETL?
- a) Daily automation: yes / no; Specific data quality tools: yes / no; Identifying data quality issues: yes; Solving data quality issues: no
 - b) Daily automation: no; Specific data quality tools: no; Identifying data quality issues: yes; Solving data quality issues: no
 - c) Daily automation: yes / no; Specific data quality tools: yes / no; Identifying data quality issues: yes; Solving data quality issues: yes
 - d) Daily automation: no; Specific data quality tools: no; Identifying data quality issues: no; Solving data quality issues: no
 - e) Daily automation: yes; Specific data quality tools: yes; Identifying data quality issues: yes; Solving data quality issues: yes
- 4) Which answer best describes the management and monitoring of your ETL?
- (Definitions:
- *Simple monitoring* (i.e.: ETL workflow monitor – statistics regarding ETL execution such as pending, running, completed and suspended jobs; MB processed per second; summaries of errors, etc.);
 - *Advanced monitoring* (i.e.: ETL workflow monitor – statistics on infrastructure performance like CPU usage, memory allocation, database performance, server utilization during ETL; job scheduler – time or event based ETL execution, events notification; data lineage and analyzer system))

- a) Restart and recovery system: no; Simple monitoring: no; Advanced monitoring: no; Real-time monitoring: no
 - b) Restart and recovery system: no; Simple monitoring: yes; Advanced monitoring: no; Real-time monitoring: no
 - c) Manual restart and recovery system: yes; Simple monitoring: yes; Advanced monitoring: yes / no; Real-time monitoring: no
 - d) Manual and automatic restart and recovery system: yes; Simple monitoring: yes; Advanced monitoring: yes / no; Real-time monitoring: no
 - e) Completely automatic restart and recovery system: yes; Simple monitoring: yes; Advanced monitoring: yes; Real-time monitoring: yes
- 5) To what degree have you defined and documented standards (e.g.: naming conventions, set-up standards, recovery process, etc.) for your ETL?
- a) No standards defined
 - b) Few standards defined for ETL
 - c) Some standards defined for ETL
 - d) Most standards defined for ETL
 - e) All the standards defined for ETL
- 6) To what degree have you implemented standards (e.g.: naming conventions, set-up standards, recovery process, etc.) for your ETL?
- a) No standards implemented
 - b) Few standards implemented for ETL
 - c) Some standards implemented for ETL
 - d) Most standards implemented for ETL
 - e) All the standards implemented for ETL
- 7) To what degree is your metadata management implemented for your ETL?
- a) No metadata management
 - b) Business and technical metadata for some ETL
 - c) All types of metadata (i.e.: business, technical, process) are managed for all ETL
 - d) Process metadata is also managed for some ETL
 - e) Business and technical metadata for all ETL

2.4 BI Applications

- 1) Which types of BI applications best describe the highest level purpose of your DW environment?
- a) Static and parameter-driven reports and query applications
 - b) Ad-hoc reporting; online analytical processing (OLAP)
 - c) Visualization techniques: dashboards and scorecards
 - d) Predictive analytics: data and text mining; alerts
 - e) Closed-loop BI applications; real-time BI applications
- 2) Which answer best describes your current BI tool usage?
(Definitions:
- *main stream BI applications* (i.e.: reporting and visualization applications);
 - *specific BI applications* (i.e.: data mining, financial analysis, etc.))
- a) One standardized tool for main stream BI and one standardized tool for specific BI applications

- b) BI tool related to the data mart
 - c) One tool recommended for main stream BI, but each department can use their own tool
 - d) More than two tools for main stream BI
 - e) One standardized tool for main stream BI, but each department can use their own tool for specific BI applications
- 3) To what degree have you defined and documented standards (e.g.: naming conventions, generic transformations, logical structure of attributes and measures) for your BI applications?
- a) No standards defined
 - b) Few standards defined for BI applications
 - c) Some standards defined for BI applications
 - d) Most standards defined for BI applications
 - e) All the standards defined for BI applications
- 4) To what degree have you implemented standards (e.g.: naming conventions, generic transformations, logical structure of attributes and measures) for your BI applications?
- a) No standards implemented
 - b) Few standards implemented for BI applications
 - c) Some standards implemented for BI applications
 - d) Most standards implemented for BI applications
 - e) All the standards implemented for BI applications
- 5) To what degree are standardized objects (e.g.: KPIs, metrics, attributes, templates) implemented in your BI applications?
- a) Objects defined for every BI application
 - b) All similar BI applications use standard objects and templates
 - c) Some reusable objects for similar BI applications
 - d) Most similar BI applications use standard objects and templates
 - e) Some standard objects and templates for similar BI applications
- 6) Which BI applications delivery method best describes the highest level purpose of your DW?
- a) Reports are delivered manually on paper or by email
 - b) Reports are delivered automatically by email
 - c) Direct tool-based interface
 - d) A BI portal with basic functions: subscriptions, discussions forum, alerting
 - e) Highly interactive, business process oriented, up-to-date portal (no differentiation between operational and BI portals)
- 7) Which answer best describes the metadata accessibility to users?
- a) No metadata available
 - b) Some incomplete metadata documents that users ask for periodically
 - c) Complete integration of metadata with the BI applications (metadata can be accessed through one button push on the attributes, etc.)
 - d) Complete up-to-date metadata documents sent to users periodically or available on the intranet
 - e) Metadata is always available through a metadata management tool, different from the BI tool

3 DW Organization and Processes

3.1 Development Processes

- 1) Which answer best describes the DW development processes in your organization?
 - a) Ad-hoc development processes; no clearly defined development phases (i.e.: planning, requirements definition, design, construction, deployment, maintenance)
 - b) Repeatable development processes based on experience with similar projects; some development phases clearly separated
 - c) Standard documented development processes; iterative and incremental development processes with all the development phases clearly separated
 - d) Development processes continuously measured against well-defined and consistent goals
 - e) Continuous development process improvement by identifying weaknesses and strengthen the process proactively, with the goal of preventing the occurrence of defects

- 2) To what degree is there a separation between the development/test/acceptance/deployment environments in your organization?
 - a) No separation between environments
 - b) Two separate environments (i.e.: usually development and production) with manual transfer between them
 - c) All the environments are distinct with automatic transfer between them
 - d) Some separation between environments (i.e.: at least two environments) with automatic transfer between them
 - e) Some separation between environments (i.e.: at least three environments) with manual transfer between them

- 3) To what degree has your organization defined and documented standards for developing, testing and deploying DW functionalities (i.e.: ETL and BI applications)?
 - a) No standards defined
 - b) Few standards defined
 - c) Some standards defined
 - d) A lot of the standards defined
 - e) A comprehensive set of standards defined

- 4) To what degree has your organization implemented standards for developing, testing and deploying DW functionalities (i.e.: ETL and BI applications)?
 - a) No standards implemented
 - b) Few standards implemented
 - c) Some standards implemented
 - d) A lot of the standards implemented
 - e) A comprehensive set of standards implemented

- 5) Which answer best describes the DW quality management?
 - a) No quality assurance activities
 - b) Ad-hoc quality assurance activities
 - c) Standardized and documented quality assurance activities done for all the development phases
 - d) + measurable and prioritized goals for managing the DW quality (e.g.: functionality, reliability, maintainability, usability)
 - e) d) + causal analysis meetings to identify common defect causes and subsequent elimination of these causes; service quality management certification

- 6) Which answer best describes the sponsor for your DW project?
- Multiple levels of business-driven, cross-departmental sponsorship including top level management sponsorship (BI/DW is integrated in the company process with continuous budget)
 - No project sponsor
 - Single sponsor from a business unit or department
 - Chief information officer (CIO) or an IT director
 - Multiple individual sponsors from multiple business units or departments
- 7) Which answer best describes your DW project management?
- (Definitions:
- project planning and scheduling* (i.e.: work breakdown structure, time, costs and resources estimates, planning and scheduling;
 - project tracking and control* (i.e.: milestone tracking, change control))
- Project planning and scheduling: no; project risk management: no; project tracking and control: no; standard and efficient procedure and documentation, evaluation and assessment: no
 - Project planning and scheduling: yes; project risk management: no; project tracking and control: no; standard and efficient procedure and documentation, evaluation and assessment: no
 - Project planning and scheduling: yes; project risk management: no; project tracking and control: yes; standard and efficient procedure and documentation, evaluation and assessment: no
 - Project planning and scheduling: yes; project risk management: yes; project tracking and control: yes; standard and efficient procedure and documentation, evaluation and assessment: no
 - Project planning and scheduling: yes; project risk management: yes; project tracking and control: yes; standard and efficient procedure and documentation, evaluation and assessment: yes
- 8) Which answer best describes the role division for the DW development process?
- No formal roles defined
 - Defined roles, but not technically implemented
 - Formalized and implemented roles and responsibilities
 - c) + periodic peer reviews (i.e.: review of each other's work)
 - d) + periodic evaluation and assessment of roles (i.e.: assess the performance of the roles and match the needed roles with responsibilities and tasks)
- 9) Which answer best describes the knowledge management in your organization for the DW development processes?
- Ad-hoc knowledge gathering and sharing
 - Organized knowledge sharing through written documentation and technology (e.g.: knowledge databases, intranets, wikis, etc.)
 - Knowledge management is standardized; knowledge creation and sharing through brainstorming, training and mentoring programs, and also through the use of technology
 - Central business unit knowledge management; quantitative knowledge management control and periodic knowledge gap analysis
 - Continuously improving inter-organizational knowledge management
- 10) Which answer best describes the requirements definition phase for your DW project?
- Ad-hoc requirements definition; no methodology used

- b) Methodologies differ from project to project; interviews with business or IT users for collecting the requirements
 - c) Standard methodology for all the projects; interviews and group sessions with both business and IT users for collecting the requirements
 - d) c) + qualitative assessment and measurement of the phase; requirements document also published
 - e) d) + causal analysis meetings to identify common bottlenecks causes and subsequent elimination of these causes
- 11) Which of the following activities are included in the testing and acceptance phase for your DW project?
- a) Unit testing by another person
 - b) System integration testing
 - c) Regression testing
 - d) User training
 - e) Acceptance testing
 - f) Standard procedure and documentation for testing and acceptance
 - g) External assessments and reviews of testing and acceptance

3.2 Service Processes (Maintenance and Monitoring Processes)

- 1) Which of the following activities are included in the maintenance and monitoring phase for your DW project?
- a) Collection of statistics regarding the utilization of the hardware and software resources (e.g.: memory management, physical disk storage space utilization, processor usage, BI applications usage, number of completed queries by time slots during the day, time each user stays online with the data warehouse, total number of distinct users per day, etc.)
 - b) BI applications maintenance and monitoring
 - c) User support
 - d) ETL monitoring and management
 - e) data reconciliation and data growth management
 - f) Security administration
 - g) Resource monitoring and management
 - h) Infrastructure management
 - i) Backup and recovery management
 - j) Performance monitoring and tuning
- 2) Which answer best describes the DW service quality management in your organization?
- a) No service quality management activities
 - b) Ad-hoc service quality management
 - c) Proactive service quality management including a standard procedure
 - d) c) + service quality measurements periodically compared to the established goals to determine the deviations and their causes
 - e) d) + causal analysis meetings to identify common defect causes and subsequent elimination of these causes; service quality management certification
- 3) Which answer best describes the knowledge management in your organization for the DW development processes?
- a) Ad-hoc knowledge gathering and sharing
 - b) Organized knowledge sharing through written documentation and technology (e.g.: knowledge databases, intranets, wikis, etc.)

- c) Knowledge management is standardized; knowledge creation and sharing through brainstorming, training and mentoring programs, and also through the use of technology
 - d) Central business unit knowledge management; quantitative knowledge management control and periodic knowledge gap analysis
 - e) Continuously improving inter-organizational knowledge management
- 4) Which answer best describes the DW service level management in your organization?
- a) Customer and suppliers service needs documented in an ad-hoc manner; no service catalogue compiled
 - b) Some customer and supplier service needs documented and formalized based on previous experience
 - c) All the customer and supplier service needs documented and formalized according to a standard procedure into service level agreements (SLAs)
 - d) SLAs reviewed with the customer and supplier on both a periodic and event-driven basis
 - e) Actual service delivery continuously monitored and evaluated with the customer on both a periodic and event-driven basis for continuous improvement (SLAs including penalties)
- 5) Which answer best describes the DW incident management in your organization?
- a) Incident management is done ad-hoc with no specialized ticket handling system or service desk to assess and classify them prior to referring them to a specialist
 - b) A ticket handling system is used for incident management and some procedures are followed, but nothing is standardized or documented
 - c) A service desk is the recognized point of contact for all the customer queries; incidents assessment and classification is done following a standard procedure
 - d) c) + standard reports concerning the incident status including measurements and goals (e.g.: response time) are regularly produced for all the involved teams and customers; an incident management database is established as a repository for the event records
 - e) d) + trend analysis in incident occurrence and also in customer satisfaction and value perception of the services provided to them
- 6) Which answer best describes the DW change management in your organization?
- a) Change requests are made and solved in an ad-hoc manner
 - b) A ticket handling system is used for storing and solving the requests for change and some procedures are followed, but nothing is standardized or documented
 - c) A standard procedure is used for approving, verifying, prioritizing and scheduling changes
 - d) c) + standard reports concerning the change status including measurements and goals (e.g.: response time) are regularly produced for all the involved teams and customers; standards established for documenting changes
 - e) d) + trend analysis and statistics regarding change occurrence, success rate, customer satisfaction and value perception of the services provided to them
- 7) Which answer best describes the DW technical resource management in your organization?
- a) Ad-hoc resource management activities (only when there is a problem)
 - b) Resource management is done following some procedures, but nothing is standardized or documented
 - c) Resource management is done constantly following a standardized documented procedure
 - d) c) + standard reports concerning performance and resource management including measurements and goals are done on a regular basis
 - e) d) + resource management trend analysis and monitoring to determine the most common bottlenecks and make sure that there is sufficient capacity to support planned services
- 8) Which answer best describes the availability management in your organization?

- a) Ad-hoc availability management
 - b) Availability management is done following some procedures, but nothing is standardized or documented
 - c) Availability management documented and done using a standardized procedure (all elements are monitored)
 - d) c) + risk assessment to determine the critical elements and possible problems
 - e) d) + availability management trend analysis and planning to determine the most common bottlenecks and make sure that all the elements are available for the agreed service level targets
- 9) Which answer best describes the release management in your organization?
- a) Ad-hoc changes solving and implementation; no release naming and numbering conventions
 - b) Release management is done following some procedures, but nothing is standardized or documented; release naming and numbering conventions
 - c) Release management is documented and done following a standardized procedure; assigned release management roles and responsibilities
 - d) c) + standard reports concerning release management including measurements and goals are done on a regular basis; master copies of all software in a release secured in a release database
 - e) d) + release management trend analysis, statistics and planning

References

Sacu, C., Spruit, M., Habers, F. (2010). DWCMM: The Data Warehouse Capability Maturity Model. Unpublished master thesis. Utrecht University, Utrecht, The Netherlands.