



# Architecture Evaluation Methods

AISA Project

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# Research Questions

- What are the evaluation needs for architecture evaluation?
- What kind of architecture evaluation methods exist?
- Which needs do these evaluation techniques satisfy?
- What do the existing methods not accomplish?

# Research Objectives

- Focus on enterprise architecture (EA) and software architecture (SA) as part of EA
- Identification of evaluation needs
- Identification of architecture evaluation methods for evaluation of EA and SA artefacts
- Mapping methods to needs

# Architecture Evaluation Needs

- Essential stakeholders' concerns to the architecture
- Needs have been identified from interviews with practitioners
- Usually certain concerns and needs for information trigger an evaluation
- Evaluation needs are derived from those triggers

# Trigger and Need Categories

- Need for the documentation of good quality
- Change pressures in organisation
- Understanding of business and ICT environments
- Company management and process planning
- Management of Architectures
- IT cost management
- Architectural decision making

# Enterprise Architecture Frameworks

- Adoption of EA frameworks to cope with the changing environment and to improve performance and competitiveness
- Combination of different views of the enterprise: business, information, application, technology architecture
- Views:
  - Knowledge transfer about the organization towards involved stakeholder roles
  - Guideline for the necessary architectural documentation

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# Enterprise Architecture Evaluation

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# Areas of EA Evaluation

- There are at least two main areas which can be evaluated regarding EA:
- enterprise architecture management and the management process
- architectural artefacts which describe the structure and behaviour of the EA

# Main Problem in EA evaluation

- Many different concepts, modelling techniques, tool support, and visualisation techniques for every view
- No coherent view on EA -> complicates the evaluation
- There is no method for assessing the whole EA

# Evaluation Approach

- Top-Down Approach
- Evaluation of every EA view
- Business Architecture, Information Architecture, Software Architecture, and Technology Architecture

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# **Business Architecture Evaluation**

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# Aspects of the Business Architecture

- Business goals and objectives
- Business functions
- Business processes
- Business roles

# Business Governance Modelling

- Vision, goals, objectives are made explicit
- Transparency of transformation drivers
- Tracing of decisions and responsibilities
- Basis for analysis and evaluation (conflicts, improvement, level of fulfilment)
- Basis for planning and changing strategies and processes (linking *why*-knowledge to *how*)

# Business Motivation Model (BMM)

- Set of concepts for modelling the business governance
- Object Management Group (OMG)
- Scheme to develop, communicate and organize corporate governance
- Central element groups are: Means, Ends, Influencer, Potential Impact and Assessments

# Business Process Modelling

- Visualization of processes
  - Processes' relationships, dependencies, and effects
  - Process activities and resources
- Enhancement of understanding about processes for many stakeholders
- Aim is clarifying the organization's processes
- 80% of process advancements are achieved



# Business Process Modelling

- Examining and modelling the organizational structure
- Examining and modelling the existing business processes (*as-is state*)
- Creating a base of the company's business processes
- Verifying business processes
- Analysing weak points
- Modelling advanced business processes (*to-be state*)

# Business Process Modelling Approaches

- Event-Driven Process Chain (EPC)
- Business Process Modeling Notation (BPMN)
- Unified Modeling Language (UML)
- Activities and events are main elements
- EPC and BPMN models can be executed
  - Enables simulation and implementation

# Business Process Simulation

- Evaluation of current processes (*as-is* state) regarding costs, performance
- Analysis of *what-if* scenarios, obtain cost and performance predictions
- Predictions support the decision making regarding organizational change and future investments
- Tools: ARIS, BPEL

# Assessing the business value of IT investments

- Measuring the value of IT-enabled business change
- Intangible benefits, such as customer satisfaction are taken into account
- Benefits are related to risks
- Future benefits or opportunities are considered

# Intel's Business Value Index

- Priority-based assessment of future investments
- Supports the prioritization of investment options
- Tangible and intangible value can be measured

# Total Economic Impact (TEI )

- Developed by Forrester
- Risk-adjusted Return on Invest calculation
- Measures cost, benefits, flexibility, and risk impact on business

# VallIT

- From IT Governance Institute (ITGI)
- Value governance
- Portfolio management
- Investment management

# Applied Information Economics (AIE)

- IT investment assessment through mathematical and scientific methods
- Developing financially-based quality assurance measures
- Developing a strategic plan for information



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# Information Architecture Evaluation

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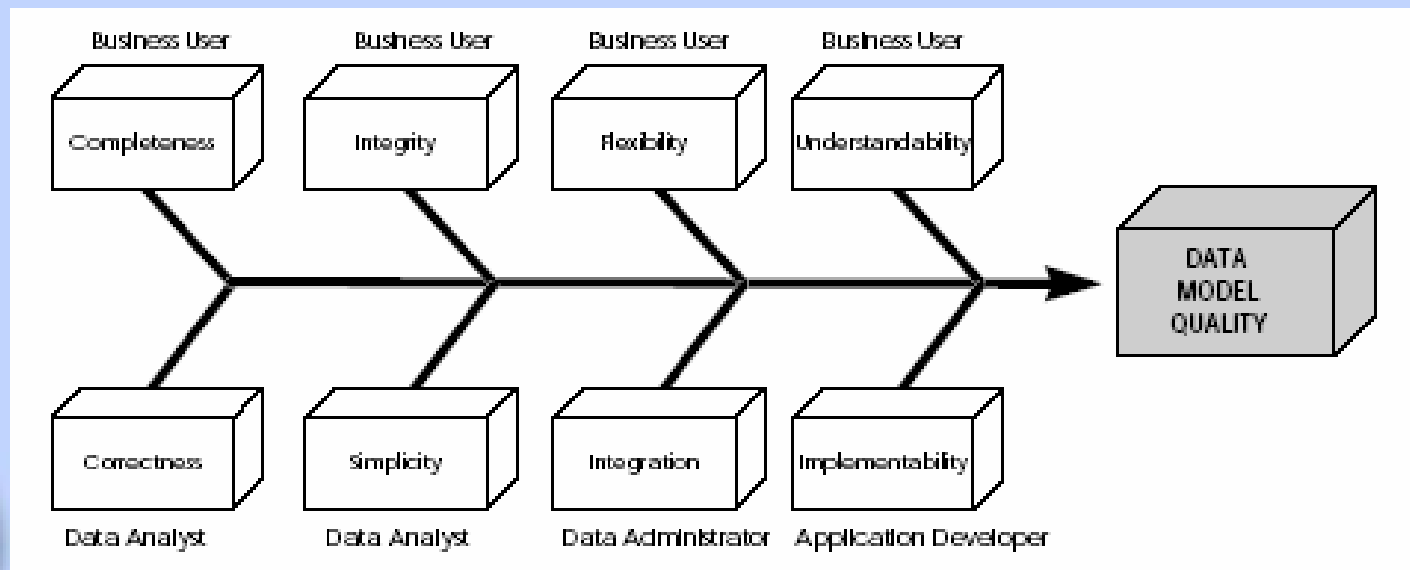
# Information Architecture

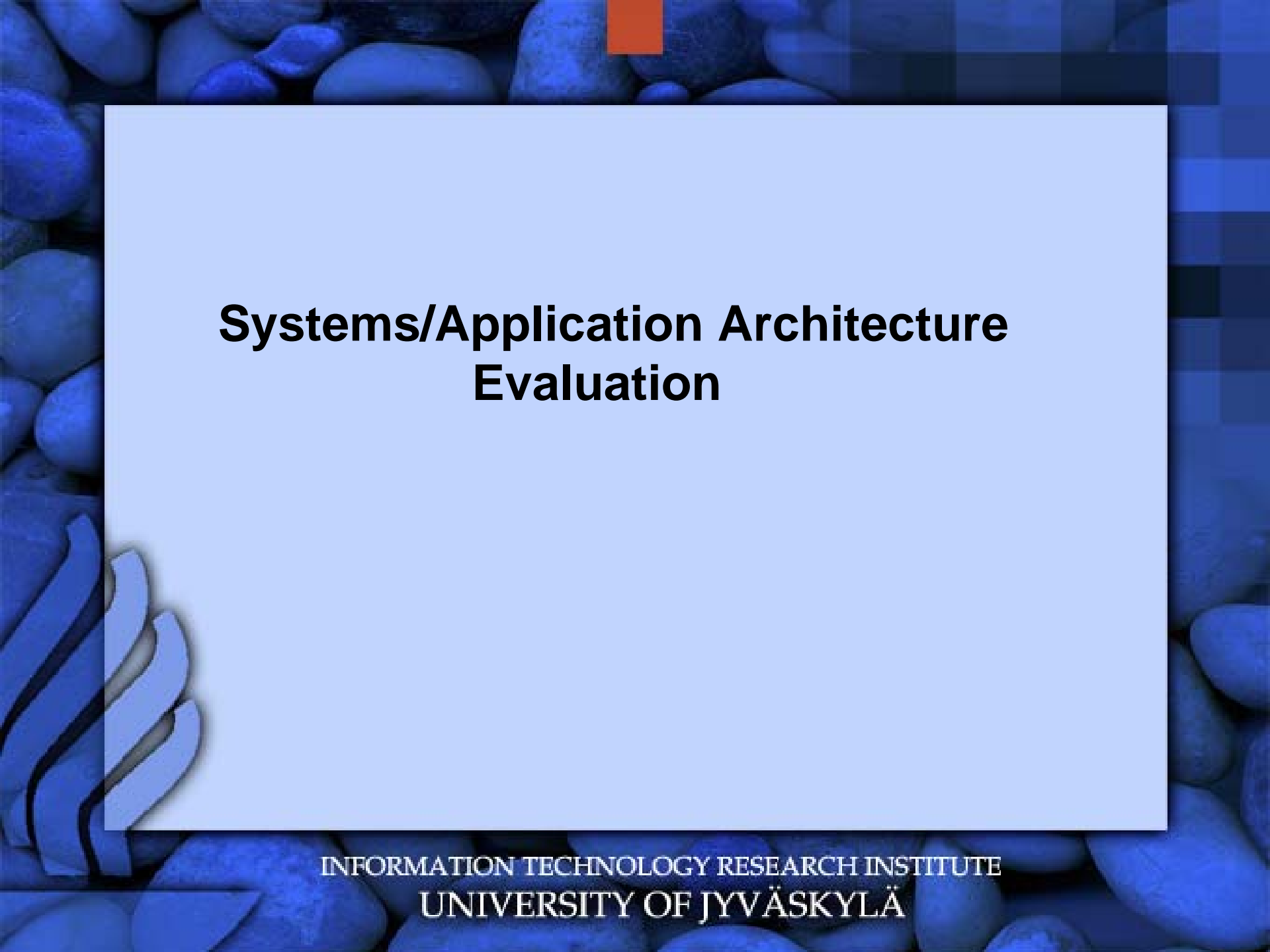
- High-level model of information which an organization needs
- Information is necessary to perform the enterprise's processes
- Information is described in entities and relation between them
- Corporate data model = conceptual data model

# Moody's Framework for Evaluating and Improving the Quality of Data Models

- Framework for conceptual data model evaluation
- Defines necessary quality factors
- Assigns stakeholder roles to quality factors
- Assessment based on metrics and stakeholder reviews

# Data Model Quality Factors and Stakeholder Roles



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# **Systems/Application Architecture Evaluation**

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# Systems/Application Architecture

- Definition of the software systems necessary to process the data and support the business
- A software system is described by the software architecture
- Software architecture describes the software system's components
  - Structure and behaviour

# Software Architecture Evaluation

- Early evaluation
  - Fragments of the architectural description exist
- Questionnaires, checklists, and scenario-based methods
- Late evaluation
  - Detailed design available
- Architectural metrics, simulation/prototyping and mathematical modelling

# Scenario-based Methods

- Evaluate the software architecture by considering it from a higher abstraction level
- Architectural description must neither be complete nor very detailed
- Scenarios describe the desired system's behaviour during performing certain tasks
- Fulfilment of certain scenario



# Architecture Trade-Off Analysis

- Scenario-based review regarding system's quality characteristics including scenario validation
- Identifies risks and points of trade-off
- Enables evaluation of structural and behavioural system characteristics
- Improves architectural knowledge sharing

# Cost-Benefit Analysis Method

- Scenario-based review with focus on cost and benefits
- Measurement of design decisions with cost and benefit metric
- Makes uncertainty explicit

# Technology Architecture

- Description of hardware and communication technology used within the organization
- Hardware and platforms
- Local and wide area networks
- Operating System
- Infrastructure software
  - Application servers, database management system, and middleware

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# Technology Architecture Evaluation

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# Technology Architecture Evaluation

- Software architecture models include a description of the execution environment
- Technology can be evaluated as part of the software system within SA evaluation
- Benchmarking for performance, scalability, and reliability evaluation of the used infrastructure

# Conclusion

- Architecture evaluation depends strongly on conceptual models (CM's)
- CM's share and communicate the architectural knowledge among different stakeholders from different domains
- CM standards are part of the evaluation methods
- CM's are evaluation input and basis for analysis and discussion about architectural decisions

# Conclusion

- Complexity of EA and variety of concerns complicates establishment of overall evaluation approach
- Only possible to apply different techniques on single architectural views of EA
- Mapping of evaluation needs and methods difficult
- Degree of needs fulfilment is uncertain
- Difficulty of methods implementation and integration