11. Information Engineering

Information Engineering is an approach to planning, generating, distributing, analyzing, and using collections of data in systems to facilitate decision making and business communication.

11.1. Differentiating Data and Information
- 11.1.1. Data types

11.2. Systems Concepts
- 11.2.1. Number systems/codes
- 11.2.2. Computer organization
- 11.2.3. Servers and virtual machines (VM)
- 11.2.4. Data centers
- 11.2.5. Network basics
- 11.2.6. ERP architectures
- 11.2.7. Workflow management systems
- 11.2.8. Web and mobile applications
- 11.2.9. Content management systems (CMS)
- 11.2.10. N-tier architectures
- 11.2.11. Web service architectures
- 11.2.12. Cloud computing and service architectures
- 11.2.13. Ecommerce system architectures
- 11.2.14. Systems integration concepts

11.3. Information Requirements for Organizations
- 11.3.1. Classification of information
- 11.3.2. Management requirements
- 11.3.3. Decision making requirements
- 11.3.4. Operations requirements
- 11.3.5. Eliciting and gathering requirements
- 11.3.6. Usability and accessibility requirements

11.4. Designing Information Outputs
- 11.4.1. Filtering
- 11.4.2. Key variable reporting
- 11.4.3. Monitoring
- 11.4.4. Modeling
- 11.4.5. Interrogative
- 11.4.6. Strategic decision center
- 11.4.7. Usability concepts
- 11.4.8. Data visualization concepts
- 11.4.9. Designing dashboards

11.5. Data Processing Overview

11.5.1. Data processing resources used in information systems
11.5.2. Organizing data processing resources
11.5.3. Cloud and data center processing concepts
11.5.4. Big data processing concepts

11.6. Data Base Concepts
11.6.1. Application vs. data base processing
11.6.2. Data base management systems
11.6.3. SQL – language, joins, filters, sorting, aggregating, grouping, union/intersection/difference, ranking

11.7. Logical Data Organization
11.7.1. Trees
11.7.2. Relational
11.7.3. Star schema/data cube/ multidimensional model
11.7.4. NoSQL models
11.7.5. Data sharing models - CSV, XML, JSON

11.8. Physical Data Organization
11.8.1. Computer storage media
11.8.2. Pointers, chains, rings
11.8.3. Types of data structures: lists, dictionaries, queues, stacks, hash tables

11.9. Storage and Processing
11.9.1. Sequential data organization
11.9.2. Direct data organization
11.9.3. Data file classification
11.9.4. File media and file organization
11.9.5. File design
11.9.6. Replication and distribution
11.9.7. Backup and recovery

11.10. System Analysis
11.10.1. Systems development methodology for information systems
11.10.2. Determining the information system demand
11.10.3. Requirements modeling
11.10.4. Data and process modeling
11.10.5. Object modeling
11.10.6. Development strategies
11.10.7. UML and other common diagramming tools in analysis

11.11. System Design
11.11.1. Development of specifications to meet demand
11.11.2. Design process
11.11.3. Data design
11.11.4. System architecture design

11.11.5. UML and other common diagramming tools in design

11.12. System Evaluation and Justification
11.12.1. Obtaining equipment proposals
11.12.2. Obtaining software proposals
11.12.3. Evaluation of proposals
11.12.4. Acquisition considerations

11.13. Controls
11.13.1. Control points for reliable data processing
11.13.2. Security controls
11.13.3. Encryption

11.14. Forms, Programs, and Procedures
11.14.1. Forms/reports design
11.14.2. Program specifications
11.14.3. Programming techniques

11.15. System Implementation
11.15.1. Training and education
11.15.2. System testing
11.15.3. System conversion
11.15.4. Implementation follow-up

11.16. Management Considerations for the Information System
11.16.1. Maintenance
11.16.2. Auditing
11.16.3. Project management of information systems and software projects
11.16.4. Managing change
11.16.5. I.T. governance

11.17. Data Analytics
11.17.1. Data preparation
11.17.2. Feature identification and evaluation
11.17.3. Model evaluation
11.17.4. Descriptive analytics
11.17.5. Clustering models
11.17.6. Classification models
11.17.7. Predictive analytics
11.17.8. Prescriptive analytics

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