



Developing a Data Warehouse for the Healthcare Enterprise

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Goal of This Session

To share practical lessons learned from implementing a data warehouse, from initial vision to system-wide release.



Learning Objectives

I will summarize our experiences:

- ▶ Enterprise Environment
- ▶ RFP Development & Vendor Selection Processes
- ▶ Key Performance Indicator Selections
- ▶ Planning and Formulation of Teams
- ▶ Designing
- ▶ Implementation



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Enterprise Environment

- ▶ Clinical load
- ▶ IT infrastructure
- ▶ Applications
- ▶ Network



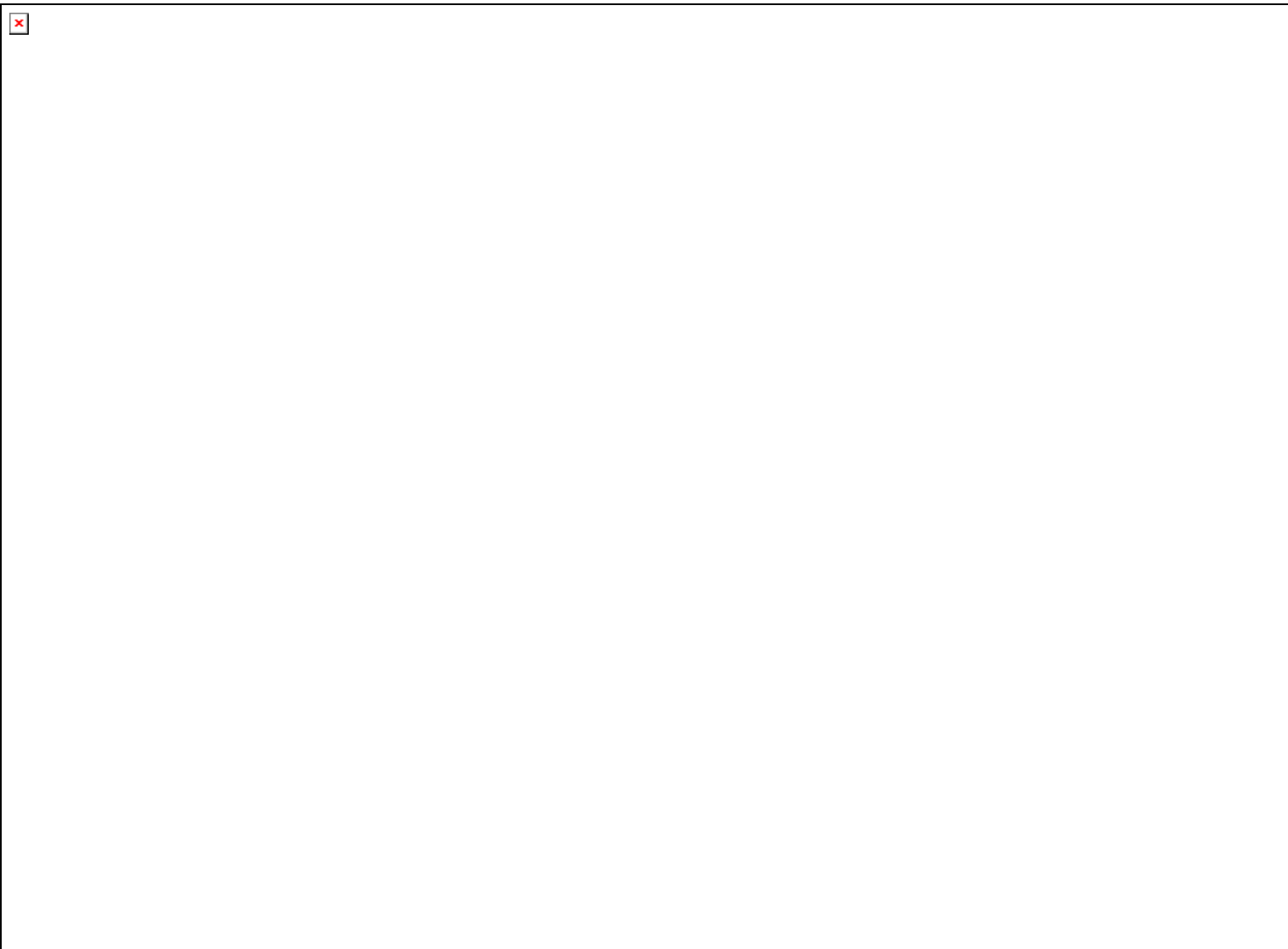


Clinical Load

- ▶ KFSHRC rank at the top in the number of bone marrow transplants performed annually, worldwide.
- ▶ At least one transplant procedure every 24 hours.
- ▶ The King Faisal Cancer Center treats 40 percent of all registered cancer cases, which are nearly 3,000 new cases every year.



Technological Eras of ITA





Applications

- ▶ ICIS is based on HNA Millennium suits from Cerner Corporation.
- ▶ The ERP solution is from Oracle Corporation.
- ▶ PACS solution.
- ▶ Legacy Systems.
- ▶ Small package solutions, eg Cbord, EndoSoft.
- ▶ Homegrown Systems, using Websphere.

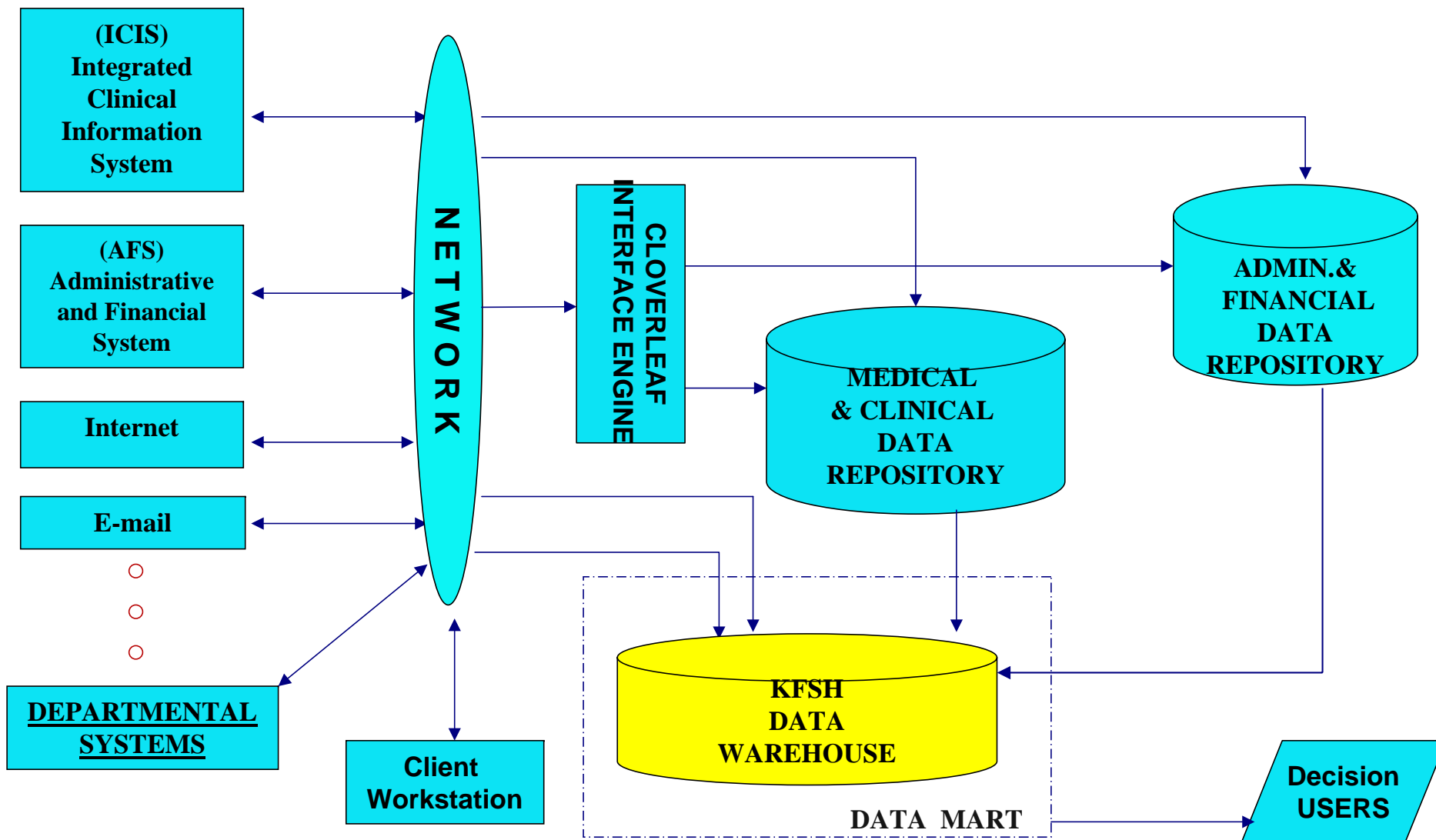


Network

- ▶ Our network infrastructure is based on a fiber cabled backbone connecting Five 6513 CISCO switches.
- ▶ 12000 wired access points.
- ▶ 900 wireless access points, with provision for 1300 wireless devices.



Integrated Information Architecture





Data Warehouse

The system is hosted on Seven fully cluster servers attached to SAN disk storage.



RFP Development

- ▶ Background
- ▶ Methodology
- ▶ RFP Development Format
- ▶ RFP Development Deviations
- ▶ Vendor Selection Activities
- ▶ Lessons Learned



Background

- ▶ Data warehouse project was for better utilization of the wealth of information collected by our source systems.
- ▶ Data Warehouse development was championed by ITA.



Goals

- ▶ To Improve method of storing and retrieving data for fact based decision making
- ▶ To Access, analyze and explore Information
- ▶ To do trend Analysis in sophisticated Graphical ways
- ▶ Timely Information for Patients, Employees & Suppliers



Methodology

Methodology difference between Data warehouse vs. other IT project.

- ▶ The first major difference was primary ownership by ITA.
- ▶ The second difference was the way we conducted the System Requirement Specifications (SRS).

The rationale for this approach was to mitigate risk, given that our user base was **unclear** in terms of their **ultimate needs**.



RFP Development Format

General RFP Information

- ▶ Enterprise Background Information
- ▶ Objective of the RFP
- ▶ Project Scope
- ▶ Proposal Preparation Guidelines
- ▶ Proposal Evaluation Criteria



RFP Development Format (Cont'd)

Proposal Response Form

- ▶ Proposal Preparation Instructions
- ▶ Proposal Response Rules
- ▶ Vendor and Project Team Information
- ▶ Implementation and Support Information
- ▶ Specifications and Capabilities
- ▶ Support and Warranty
- ▶ Price



RFP Development Format (cont'd)

Supporting Information Required

- ▶ Contract Administration and Compliance
- ▶ Technical Environment and Hardware Sizing Information
- ▶ Performance Measuring Criteria



RFP Development Deviations

- ▶ The requirements of the hospital departments and executive management were not clear.
- ▶ ITA management was charged with developing the RFP for data warehouse project.
- ▶ RFP development committee had minimum representation from clinical, administrative, academic, or financial divisions.



Vendor Selection Activities

Key Vendor Selection Process Activities:

- ▶ Decision criteria
- ▶ Finalizing the schedule of events
- ▶ Review, analysis and evaluation of RFP responses
- ▶ Organizing vendor demonstrations
- ▶ Primary and alternate vendor selection



Vendor Selection Activities (Cont'd)

Key Vendor Scoring and Assessment Criteria:

- ▶ Technical Solutions offered
- ▶ Services Level Promises
- ▶ Project Approaches
- ▶ Vendor Qualifications
- ▶ Price
- ▶ Quality of Vendor Responses
- ▶ Customer References



Vendor Selection Activities (cont'd)

Key aspects of Proposal Evaluations:

- ▶ Vendors References
- ▶ Vendor's Technical Capabilities
- ▶ Functionalities of solutions



Vendor Selection Activities (Cont'd)

Project Award – Vendor with Data Warehouse experience, though not in Healthcare. Fixed price contract.

Unique Stance

- ▶ We put condition to withdraw the contract if the vendor failed to demonstrate competency during SRS.
- ▶ We requested vendor to provide functional consultant (physician) with experience in data warehouse implementation and performance management.



Lessons Learned

- ▶ System Requirement Specification (SRS) should be part of the contract.
- ▶ Use of functional consultant (physician) with Data Warehouse, Performance management and hospital management experiences
- ▶ Fixed price contract will reduce the risk of delay and control costs
- ▶ Involvement of key management is crucial for successful Data Warehouse project.



Key Performance Indicators Selection



Background

- ▶ How KPIs were Identified, Selected and Developed
- ▶ Magnitude of KPIs from identification to Development
- ▶ Challenges
- ▶ Lessons Learned



Identification, Selection & Development

Organizational Structure

- ▶ Executive
- ▶ Administrative
- ▶ Project



Administrative Committee

- ▶ Setting the direction of selection process
- ▶ Criteria for choosing department visited
- ▶ Departments visits



Magnitude of KPIs

- ▶ 325 KPIs were identified
- ▶ 196 KPIs were refined and defined
- ▶ 46 KPIs were developed



Magnitude of KPIs (contd)

The 46 KPIs that were developed translated into 100 deliverables consisting of:

- ▶ Dashboards
- ▶ Scorecards
- ▶ Analytical Reports
- ▶ Detailed Reports.



Challenges

- ▶ Relevancy
- ▶ Agree on definition references
- ▶ Source system gap
 - Data gaps
 - Process gaps
- ▶ Source system expert shortage



Lesson Learned

Gradual approach should be taken whereby, user should be oriented with simple reports before going into complex multi-dimensional analytical reports of KPIs



Planning and Formulation of Development Team for Data Warehouse



Planning- Business Analyses

System Requirement Specifications Includes:

- ▶ Identification of Business Requirements
- ▶ Mapping Business Requirement to Source System
- ▶ Identification of Gaps
- ▶ Recommending Solutions for Gaps
- ▶ Core Decision Making & Reporting Needs were linked to KPIs
- ▶ User Acceptance Criterion
- ▶ Reviewing, Validating and Accessing Quality of SRS



Development Team

Vendor Team Consisted of :

- ▶ Project Manager (1)
- ▶ Functional Consultants (2)
- ▶ Data Modeler/Architect (2)
- ▶ ETL/DBA Developer (3)
- ▶ OLAP Developers (3)
- ▶ Test Engineer (1)



Development Team (Cont'd)

KFSH&RC Team Consisted OF :

- ▶ Project Manager (1)
- ▶ Technical Project Manager (1)
- ▶ Business Analysts (2)
- ▶ ETL/DBA Developer (1)
- ▶ OLAP Developers (3)



Development Team (Cont'd)

Skill Sets of Functional Team

Good knowledge of:

- ▶ Clinical & Medical
- ▶ Financial
- ▶ Logistics
- ▶ Communication
- ▶ Facilitation



Development Team (Cont'd)

Skill Sets of Technical Team

Good knowledge of:

- ▶ Cognos BI Products
- ▶ Informatica ETL Products
- ▶ ERWIN Data Modeling
- ▶ Oracle 10G



Development Team (Cont'd)

Lessons Learned

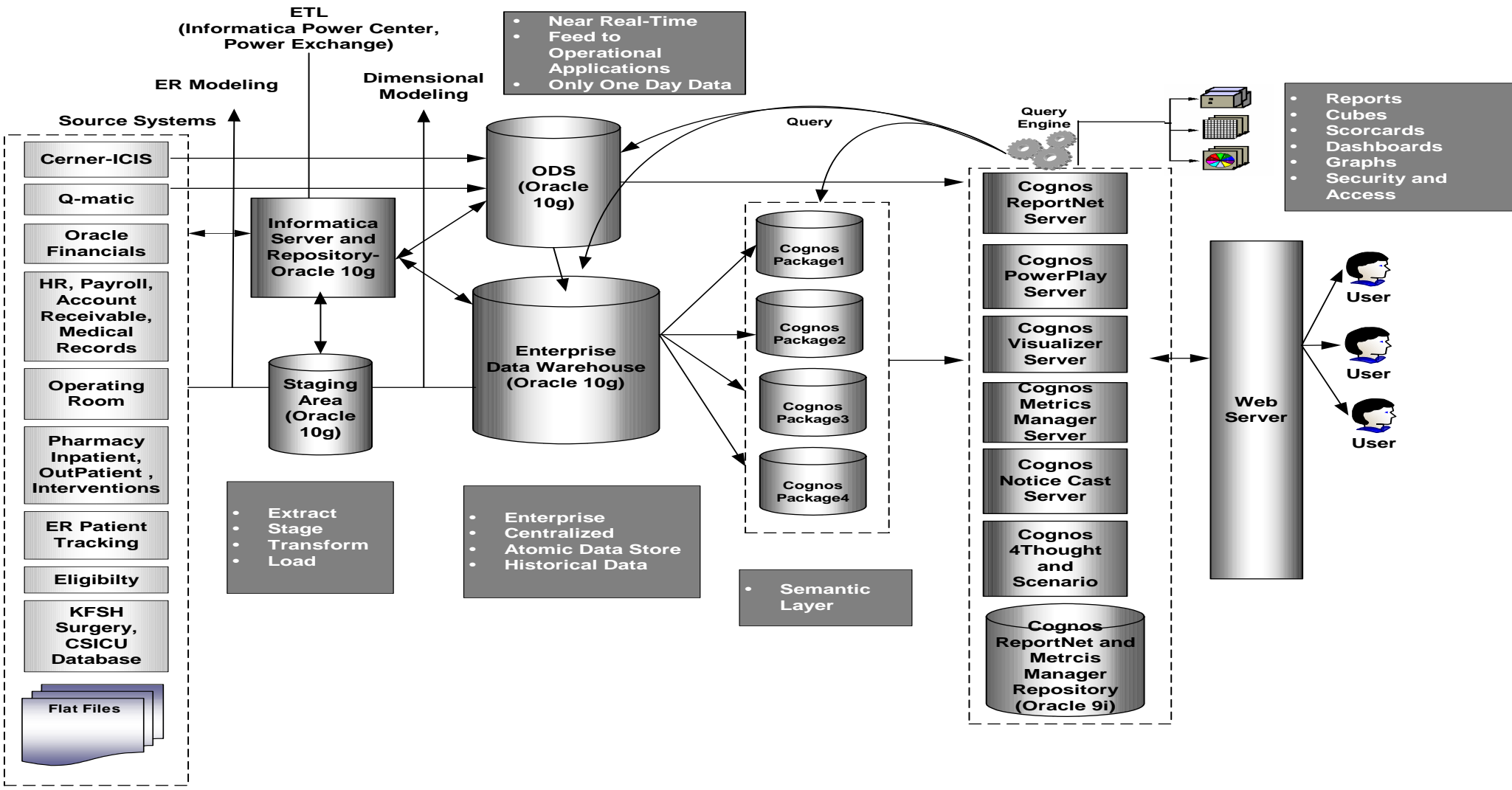
- ▶ Functional team should have good business knowledge
- ▶ Adequate & Dedicated Resources should be deployed for the entire duration of the project



Design Architecture



Architecture - Logical





Architecture - Physical

- ▶ Scalability
- ▶ Availability
- ▶ Performance
- ▶ Stability
- ▶ Security



Lessons Learned

- ▶ Understanding thoroughly the business processes and available data sources
- ▶ The design of a data model is an iterative process
- ▶ Cleansing of data is crucial
- ▶ Scalability is very important



Implementation Phase



Implementation

- ▶ Extraction-Transformation-Loading (ETL) Build
- ▶ On-Line Analytical Processing (OLAP) Build
- ▶ User Acceptance Testing (UAT)



Implementation (cont'd)

ETL Build consisted of developing script to do:

- ▶ Extracting
- ▶ Cleansing
- ▶ Transforming
- ▶ Loading



Implementation (cont'd)

OLAP Build consisted of developing:

- ▶ Dynamic Reporting
- ▶ Powerplay Cubes for Analytical Reports
- ▶ Matric Manager for Scorecards
- ▶ Visualizer for Dashboards



Implementation (cont'd)

User Acceptance Testing consisted of:

- ▶ Testing of ETL & OLAP Deliverables
- ▶ Validating Quality of Data & Information



Lessons Learned

- ▶ Implementation success highly depends on sound Planning & Designing phase
- ▶ Successful User Acceptance requires addressing and incorporating users needs and prospective



Thank you