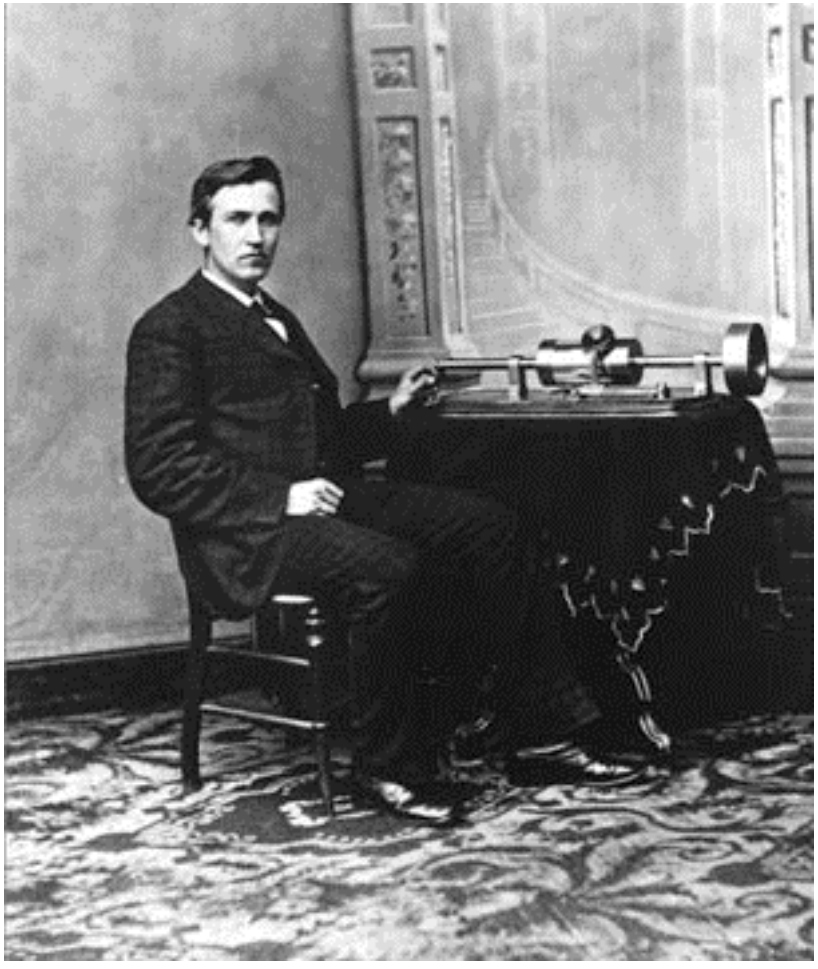
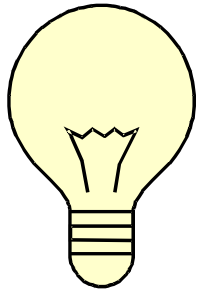
Knowledge is a complex topic

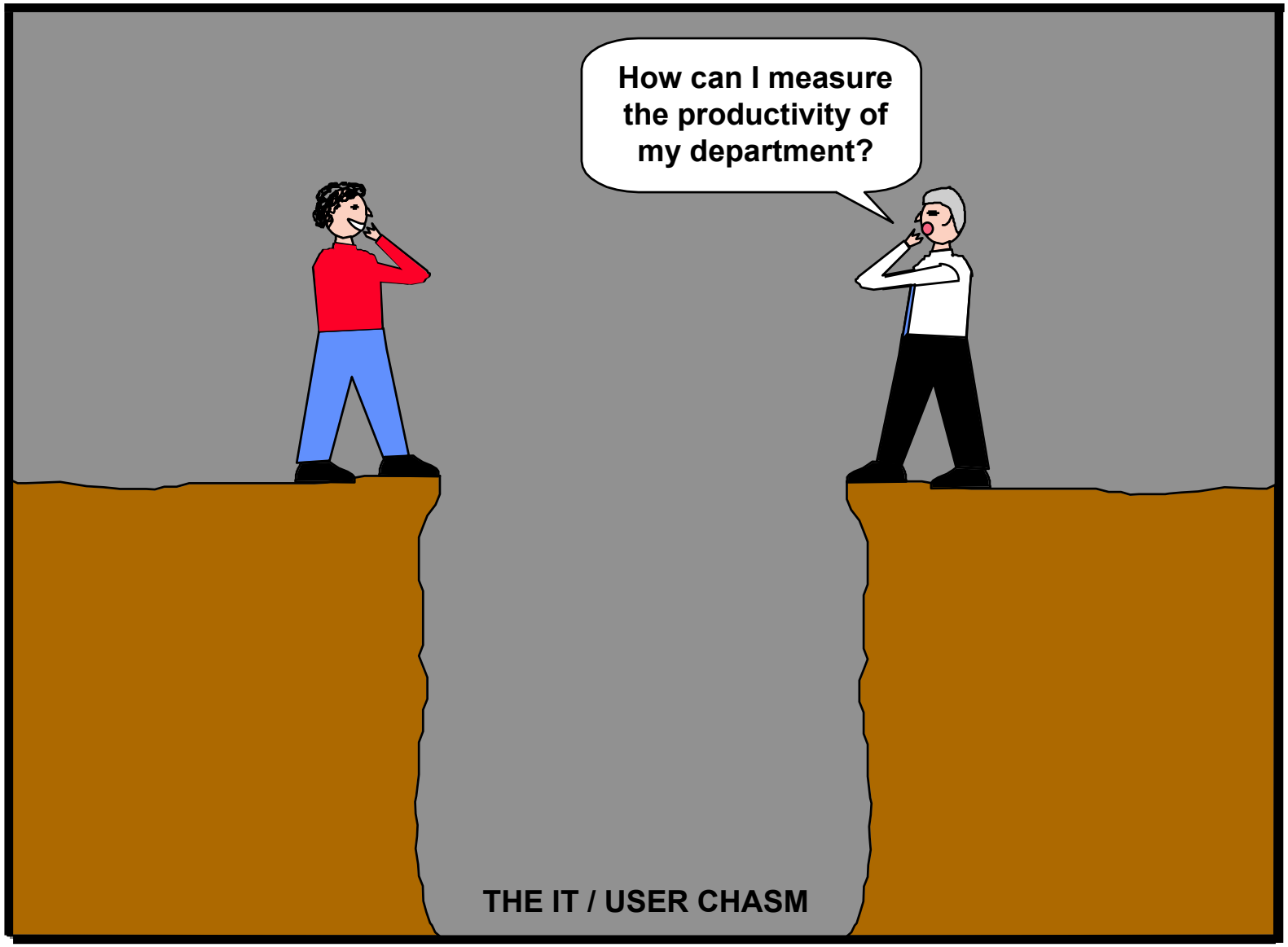


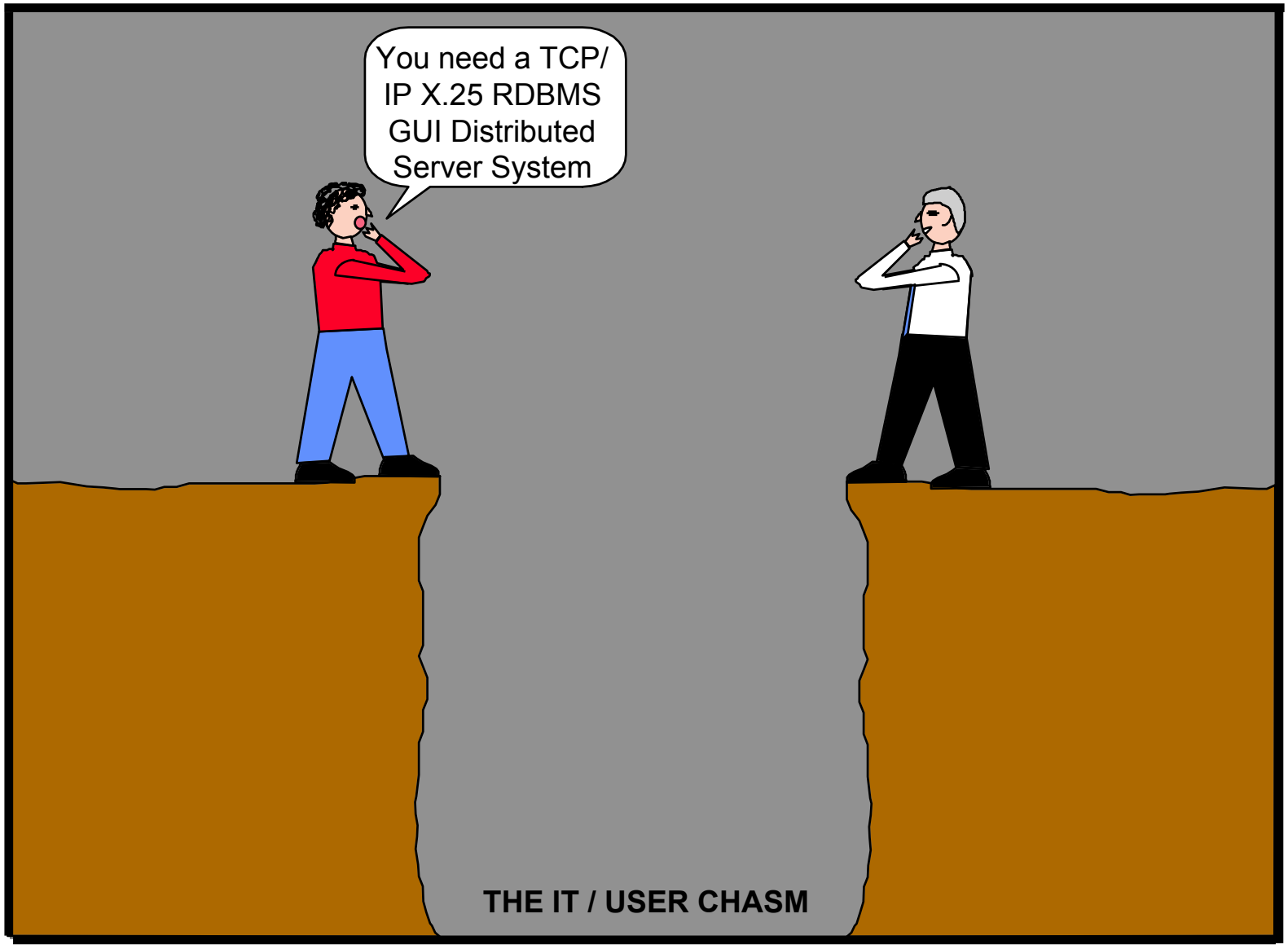
"We do not know one millionth of one percent about anything"

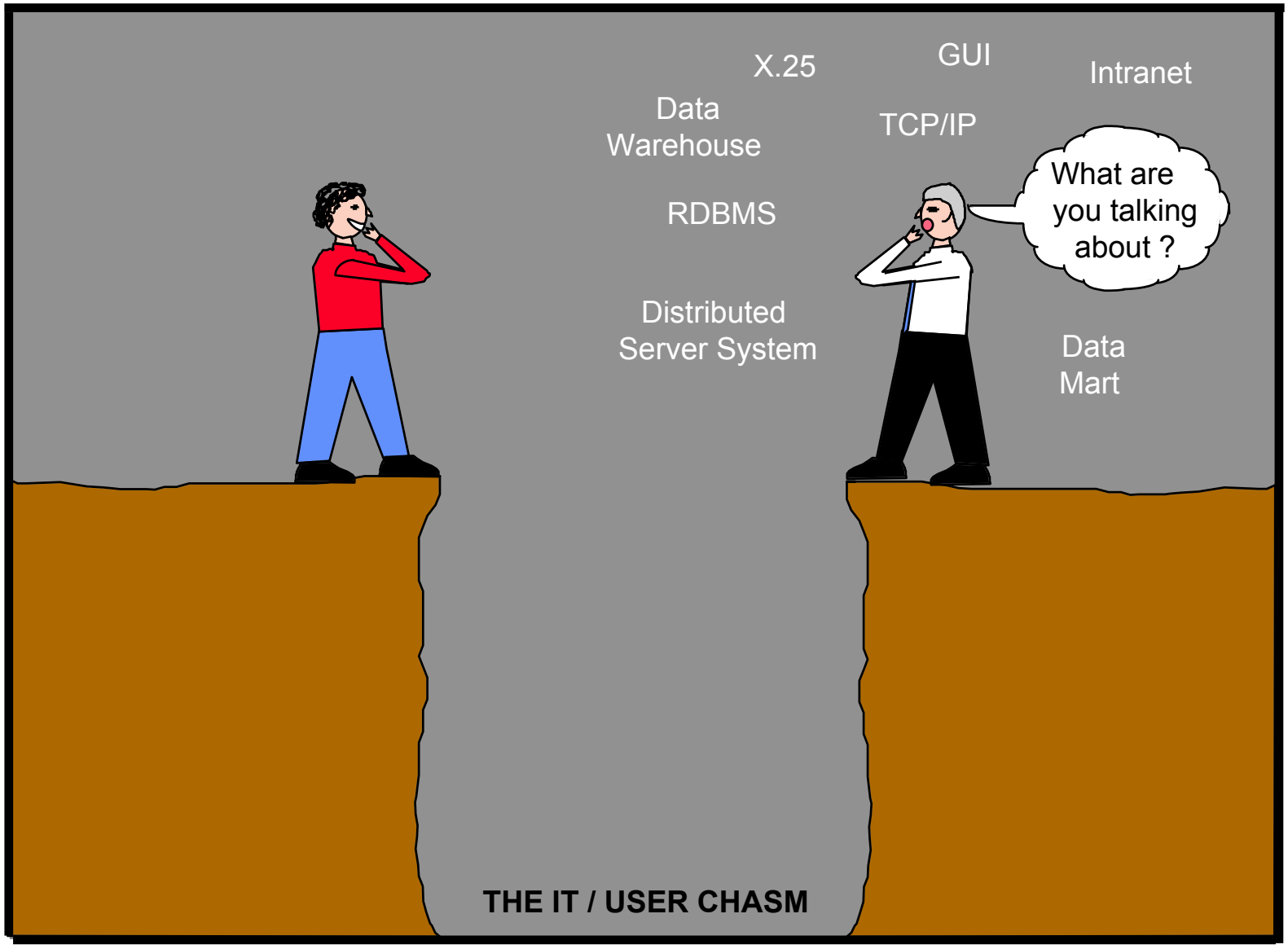
Thomas Alva Edison

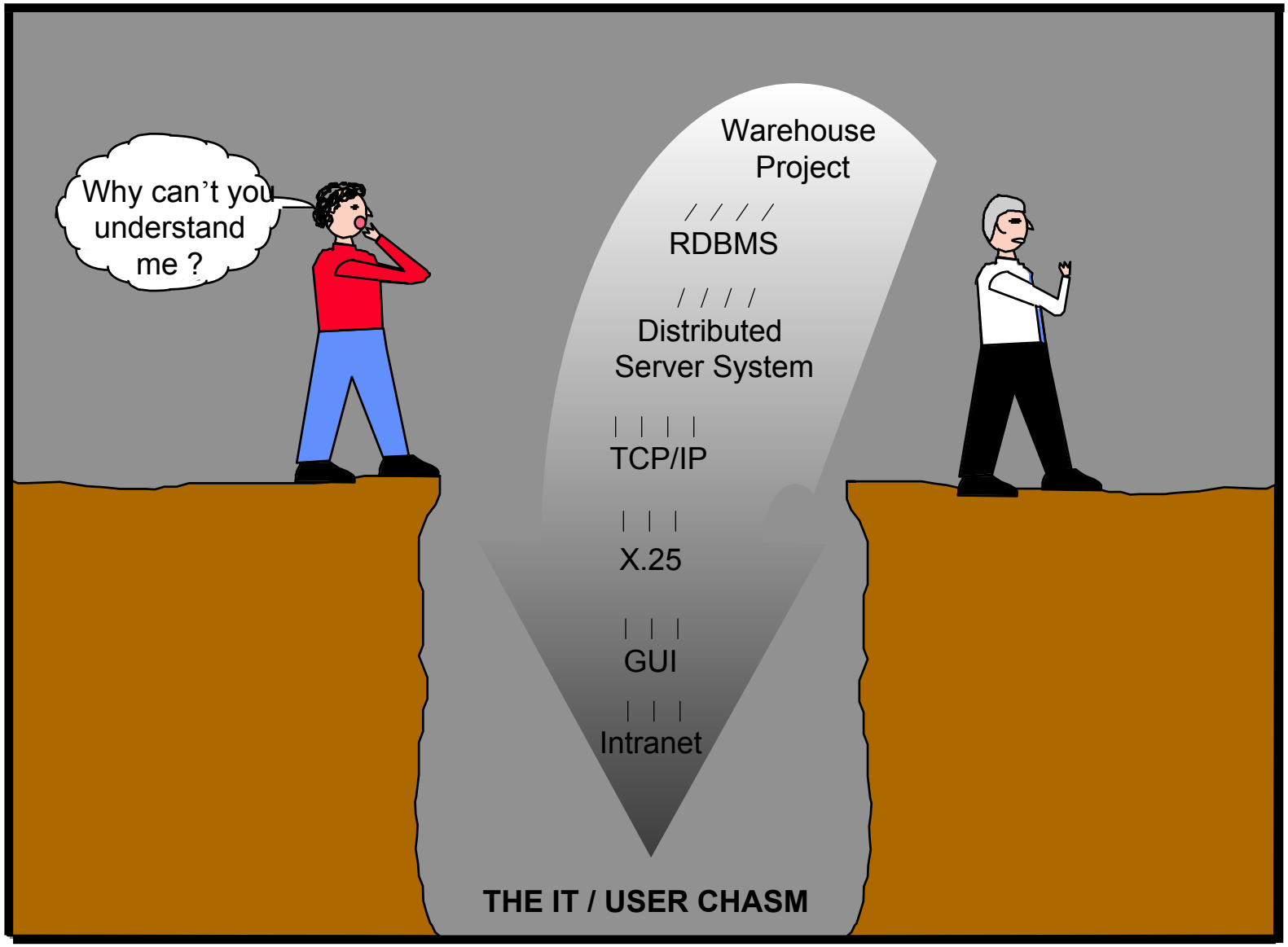


Information Alignment


How can I measure the productivity of my department?
THE IT / USER CHASM

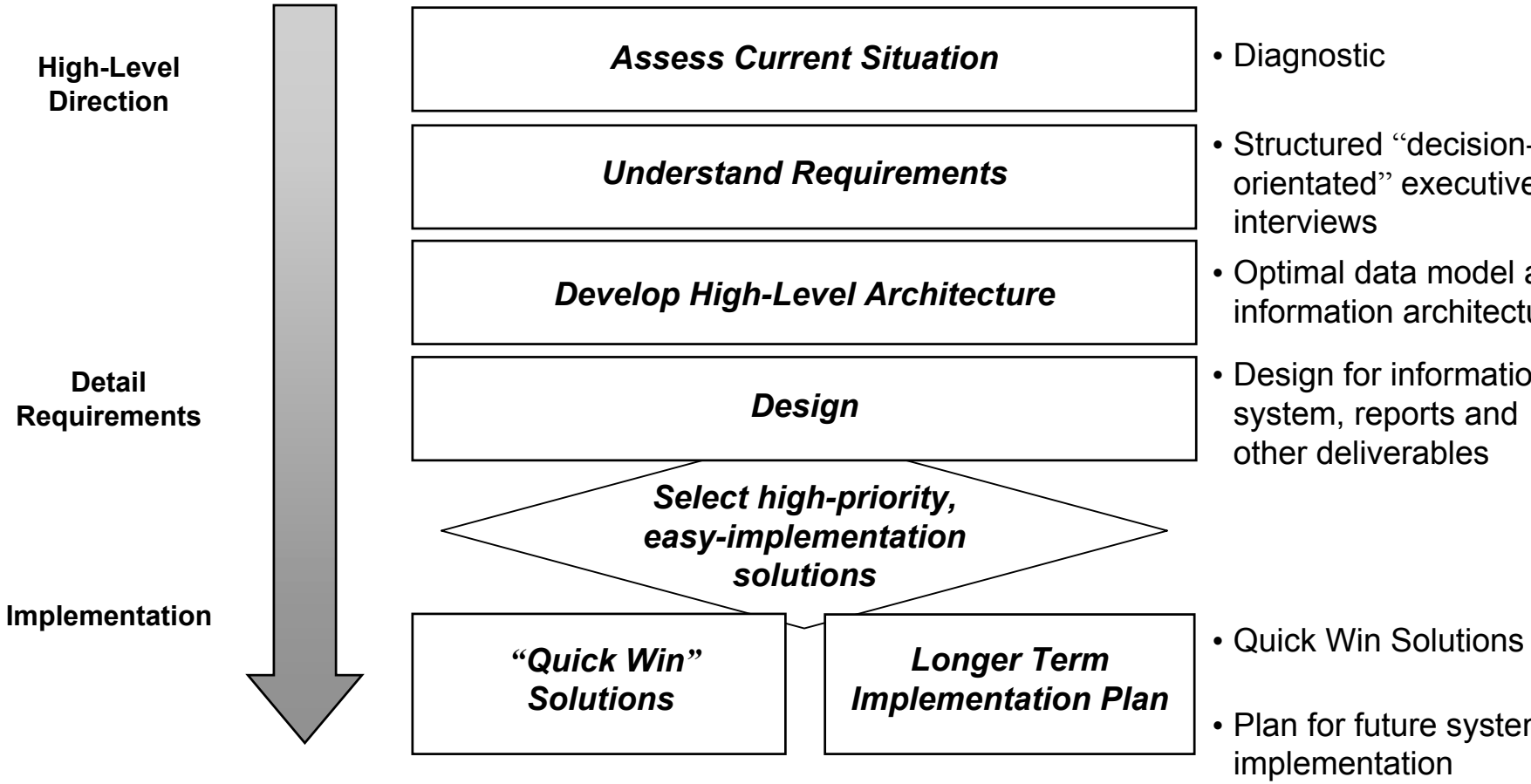

You need a TCP/ IP X.25 RDBMS GUI Distributed Server System
THE IT / USER CHASM


X.25
GUI
Intranet
Data Warehouse
TCP/IP
What are you talking about ?
RDBMS
Distributed Server System
Data Mart
THE IT / USER CHASM


Why can't you understand me ?
Warehouse Project
RDBMS
Distributed Server System
TCP/IP
X.25
GUI
Intranet
THE IT / USER CHASM

Experience shows that a top-down approach to knowledge systems, usually leads to better results with greater longevity

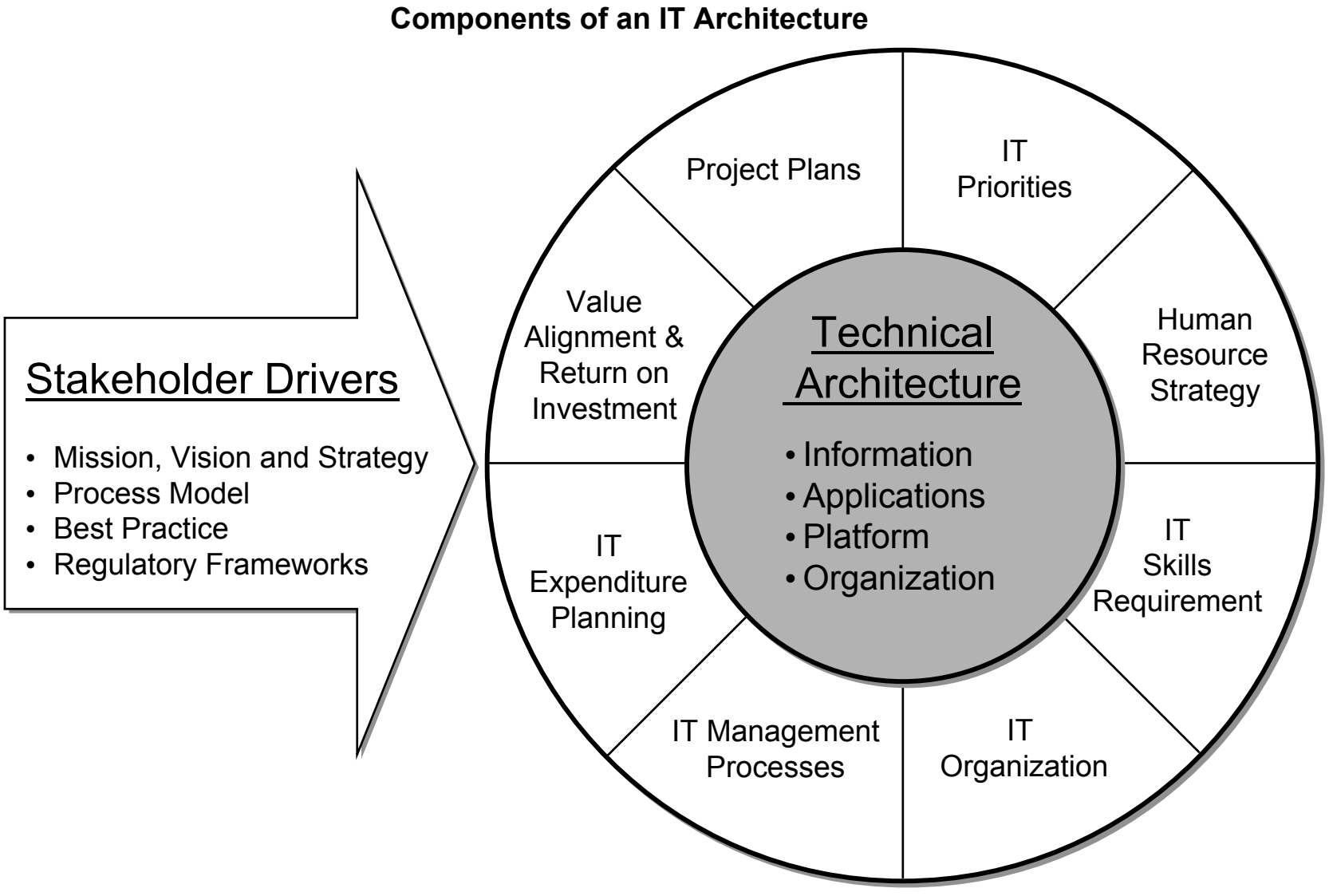
Top Down Approach to Knowledge Systems Improvements



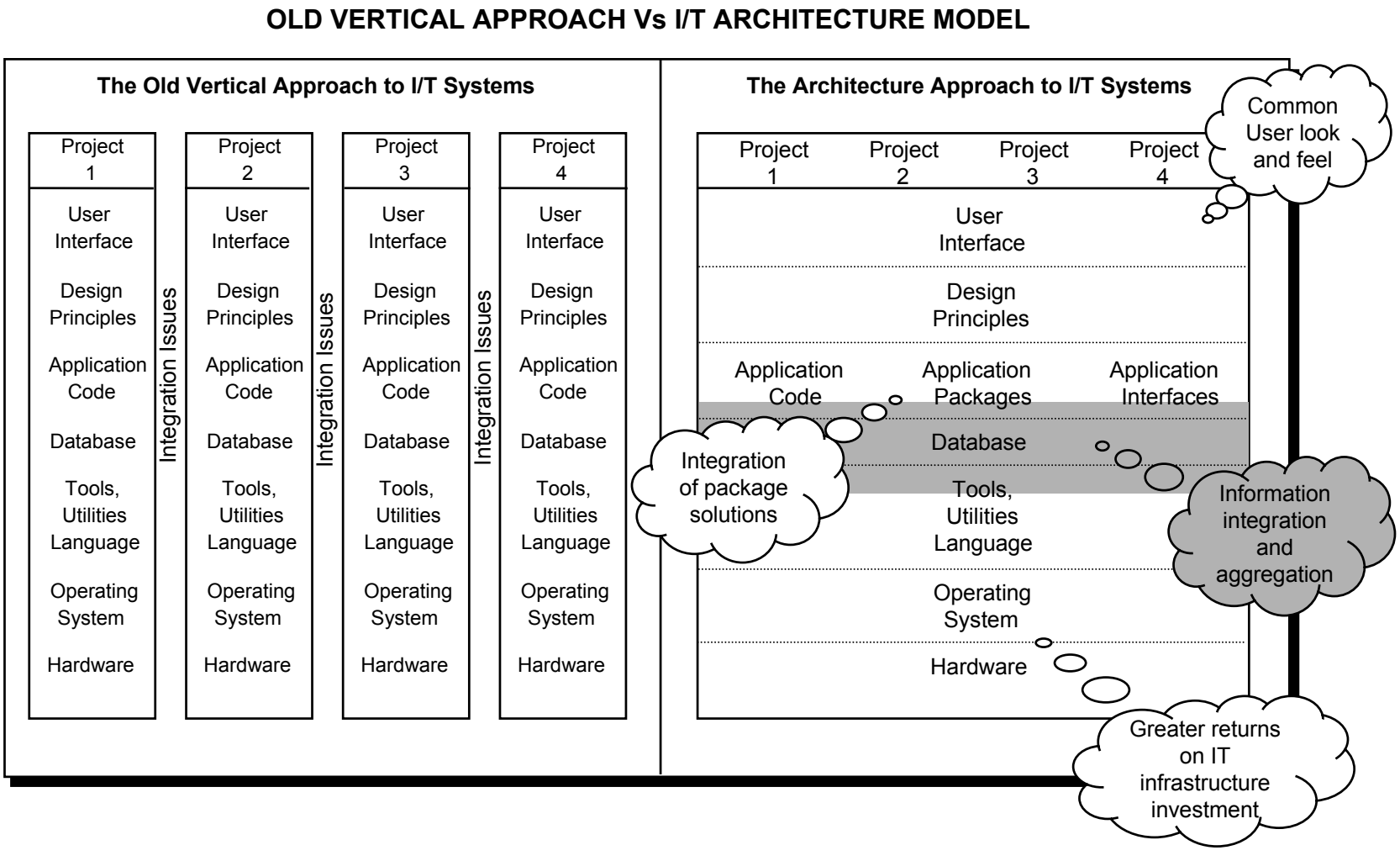
Many organizations use information technology enterprise architecture principles to improve their knowledge systems

- Objectives of implementing an information architecture
  - To make better IT investment decisions through improved planning
  - To ensure that the data implications of the information needs have been properly addressed and considered
  - To guide the design and construction of future data stores and decisions on the placement of data and access
  - To improve existing data stores with more focus on user requirements
  - To develop knowledge management approach and culture
  - To develop better information management
- Typical results, benefits and value
  - Establishes a solid base for defining database requirements
  - Provides a consistent mapping of information needs to data requirements to data stores in a consistent manner avoiding rework, providing a single top-down view
  - Provides a mechanism to drive clarity in user data requirements thinking
  - Provides the foundation for the design and deployment of appropriate data stores
  - Provides a set of criteria to be used in the evaluation of alternative solutions
  - Improves the integrity of data used by the business processes

IT can be aligned to the organization through the development of an organization-wide IT Architecture

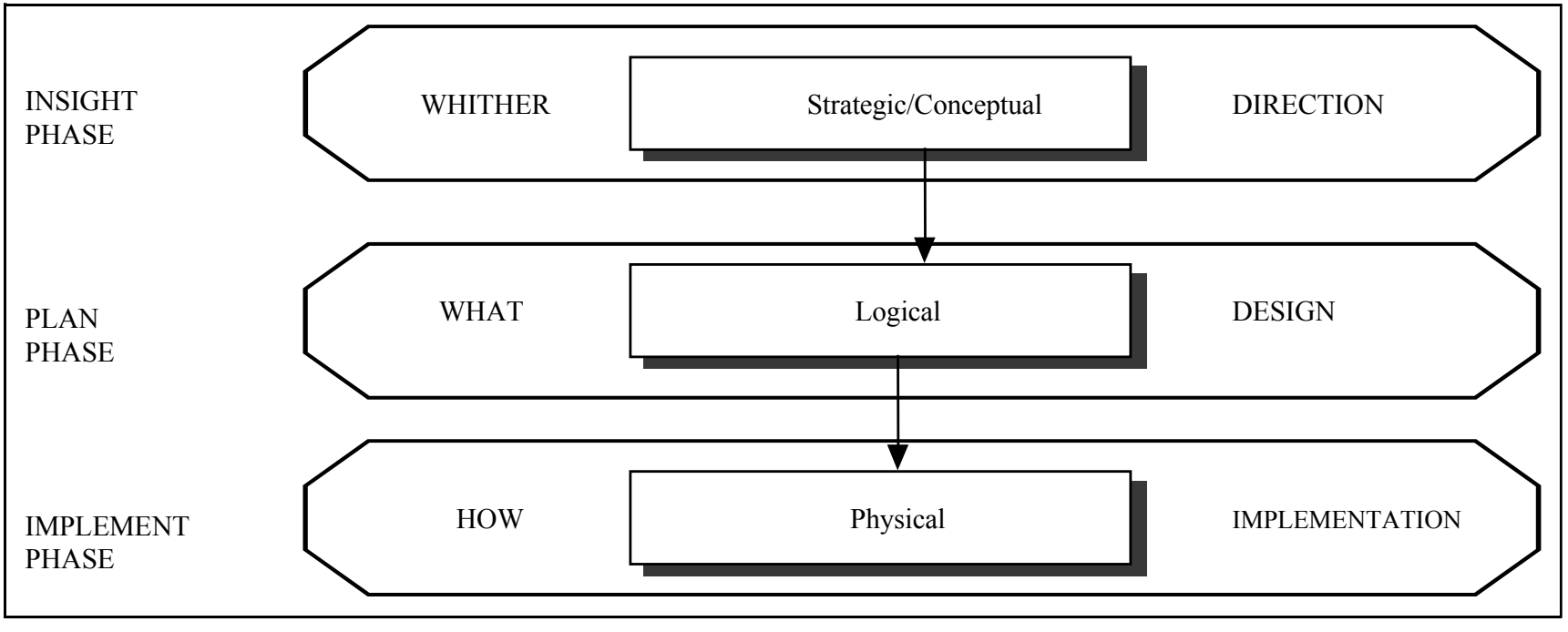


Using an architecture approach to IT systems enables greater integration and ensures that more value is received from the IT investment

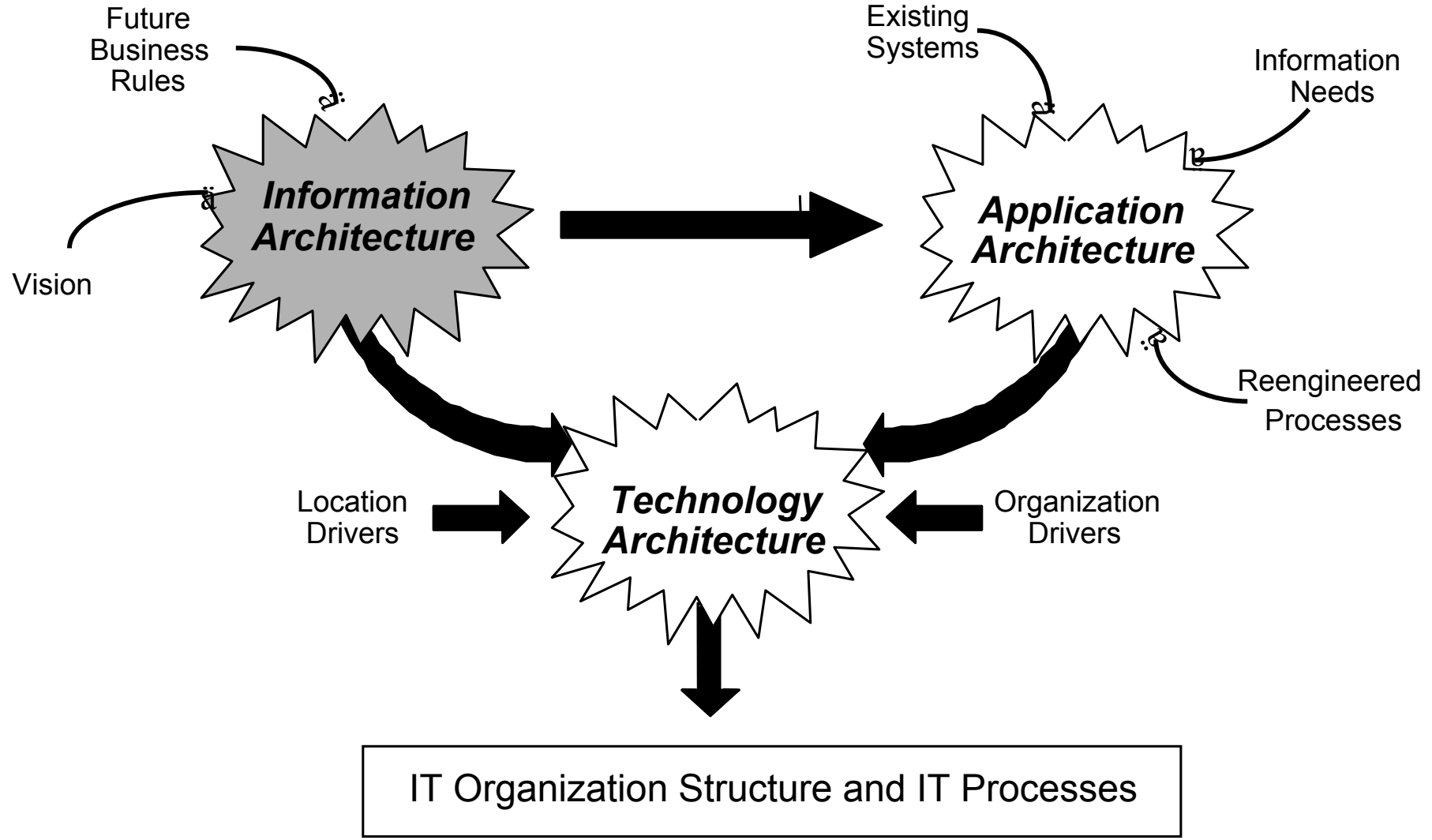


Over three stages, the information architecture migrates from strategic to logical and finally to physical design

Three Stage Information Architecture Development



An overall information technology information model is founded on the determination of the needs for information in an overall data architecture…



The information architecture should graphically represent the organization's information requirements

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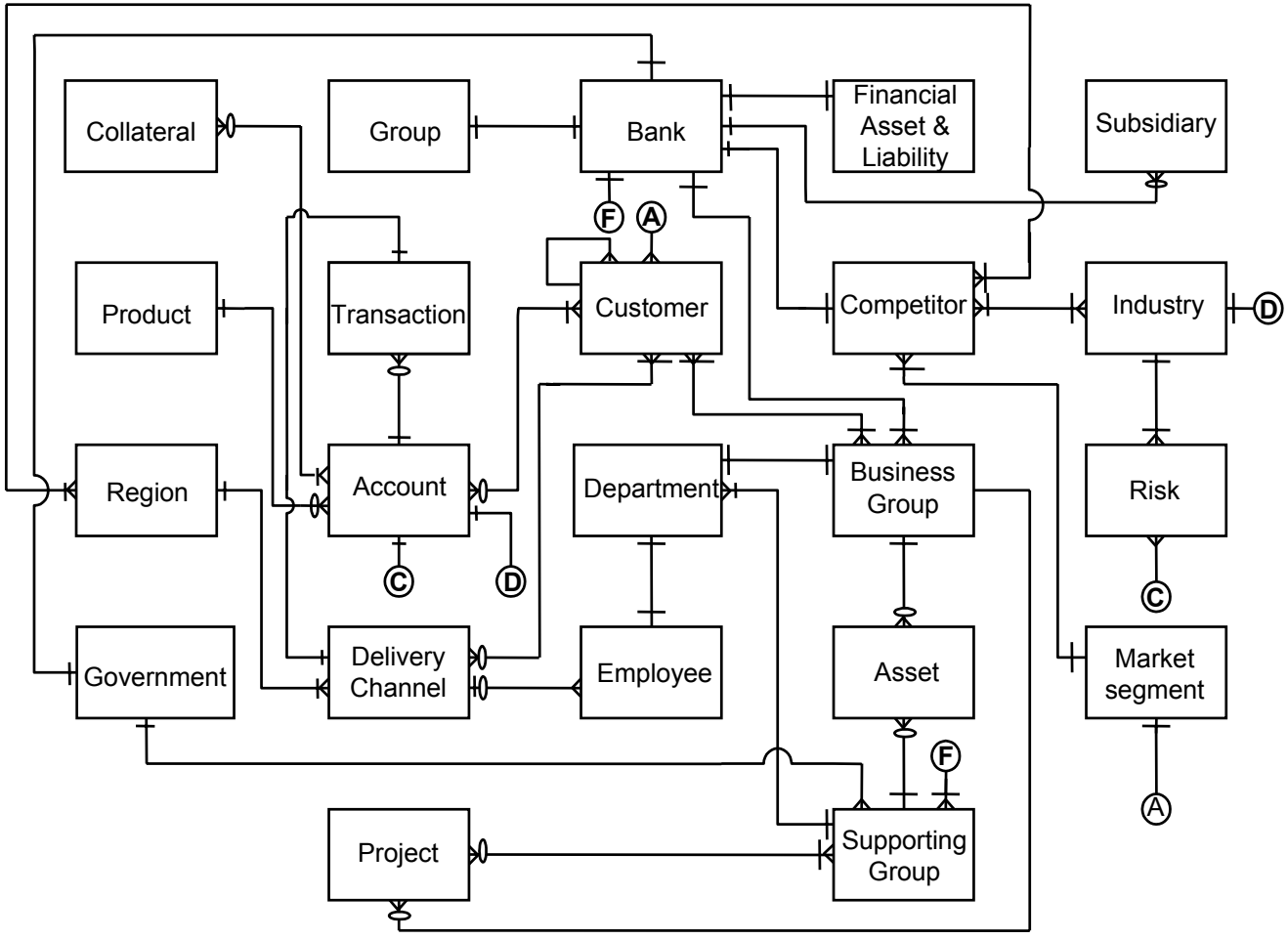
Information Architecture



Data Model Legend

= Data Entity

Relationship Symbols

= Zero to Many

= One and only one

= One to Many

= Zero or One

Ⓧ = Jump

Data Models should use terminology that anyone in the organization can understand

nformation Architecture - Data Model - Top Level

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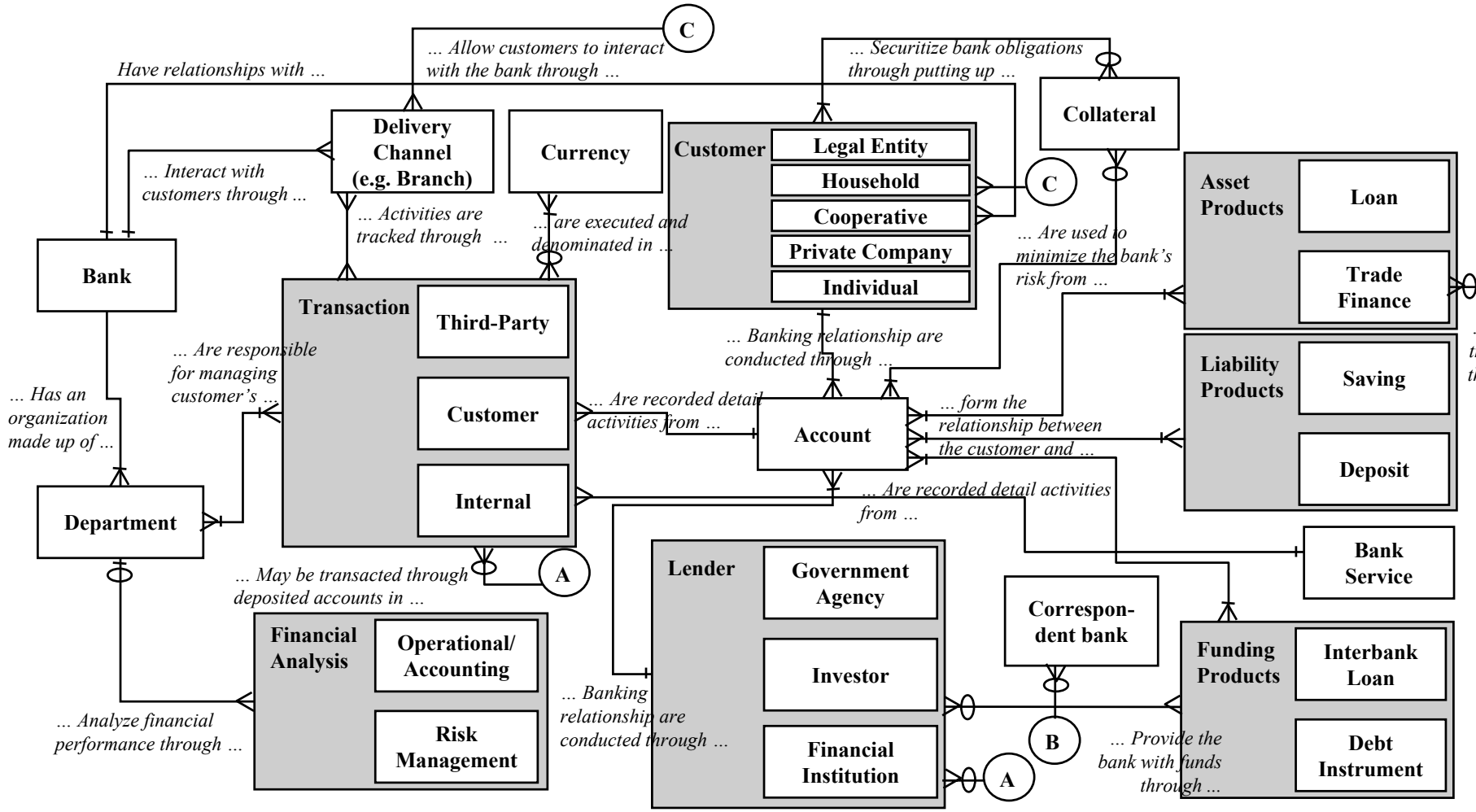
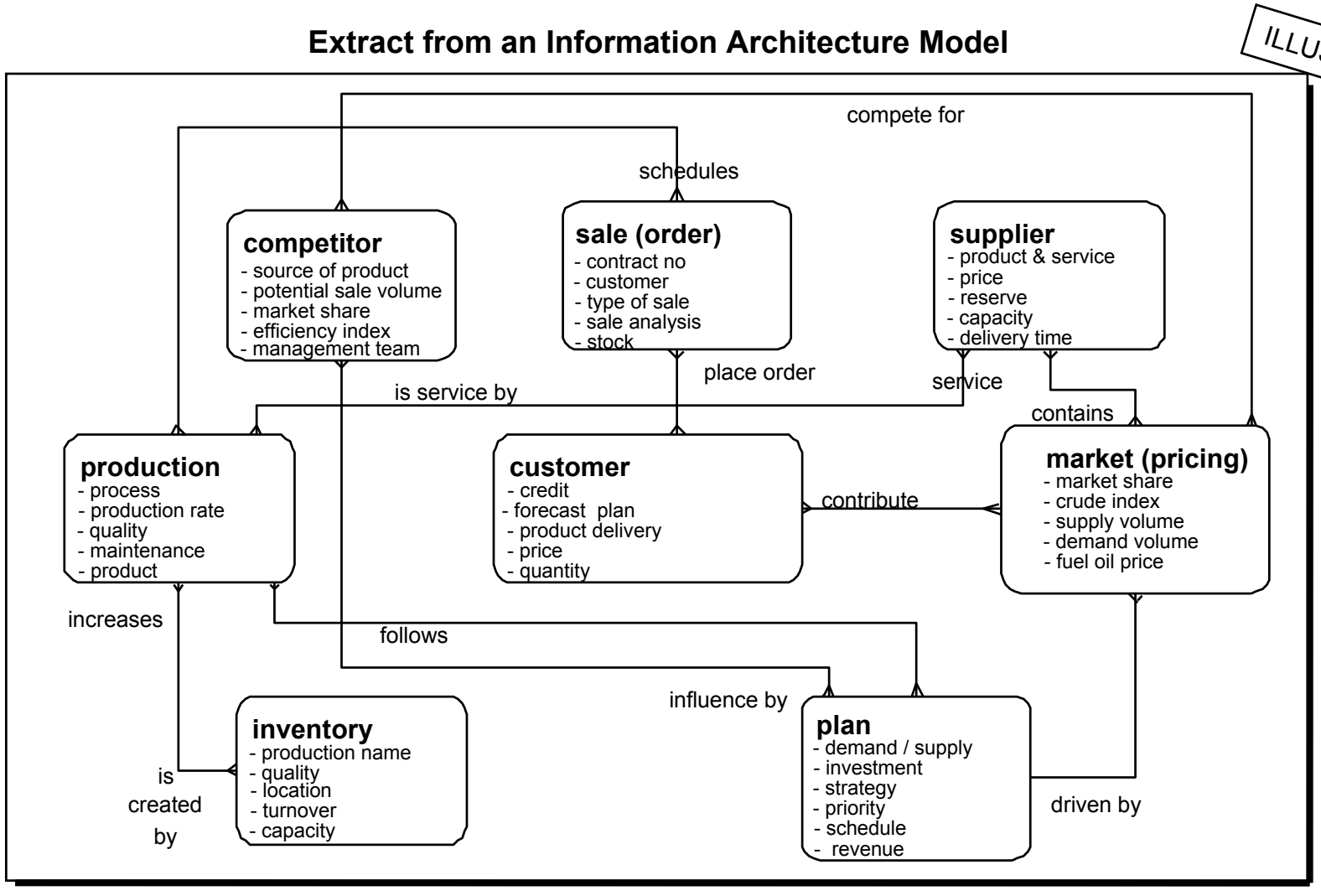
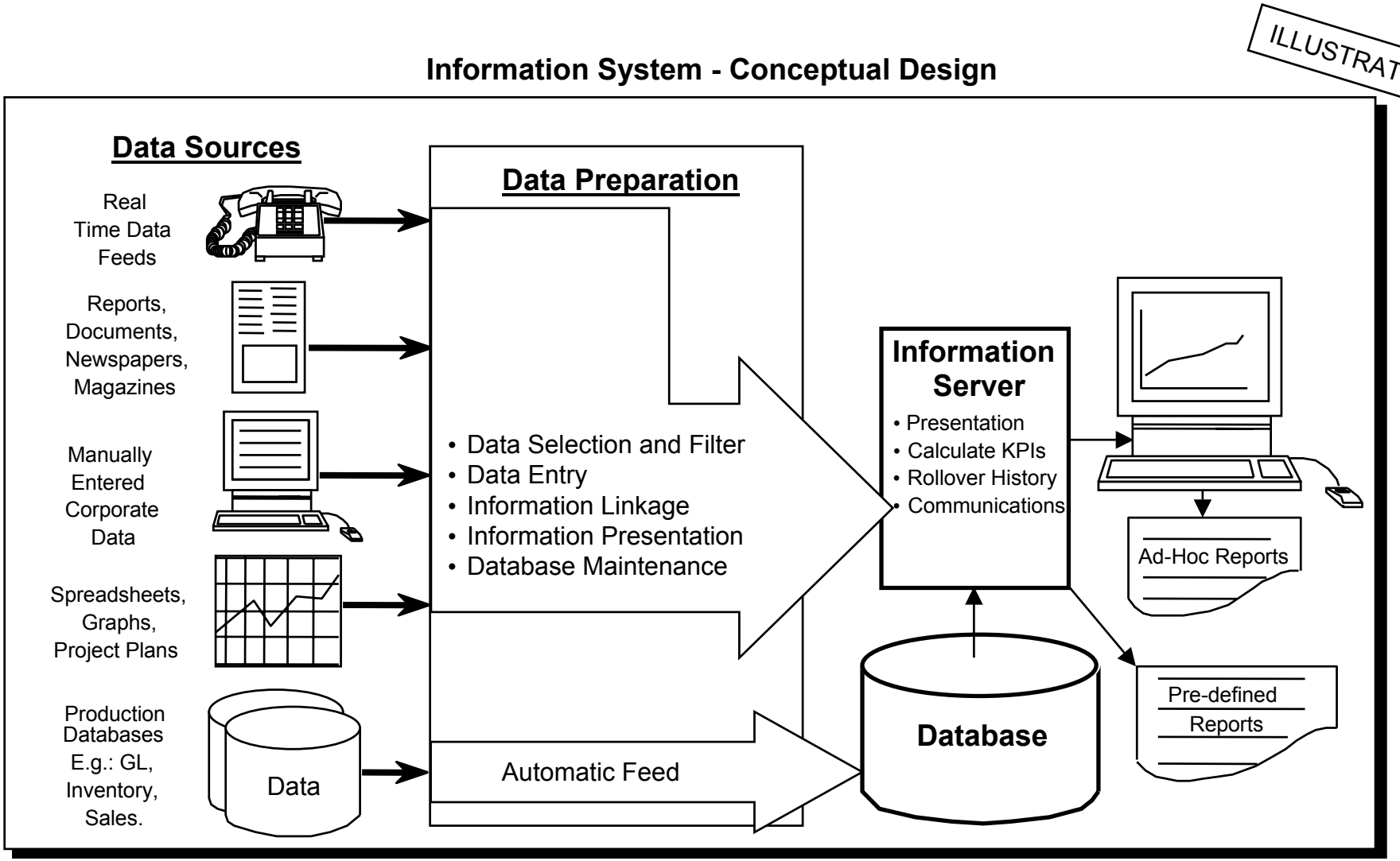


A Data Model can form the starting point of an information systems design and/or package selection process



A Data Model can form the starting point of an information systems design and/or package selection process



Typically processing and information architectures are split into two separate approaches

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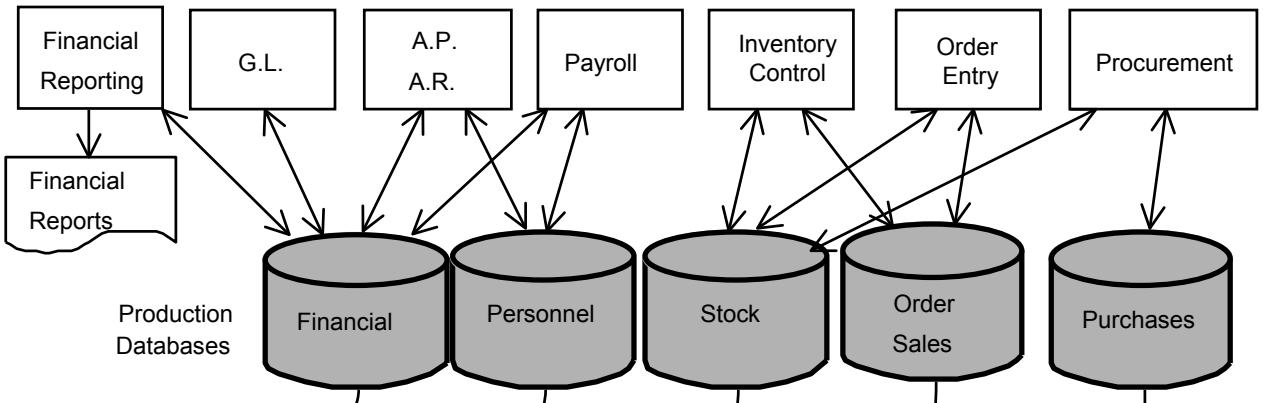
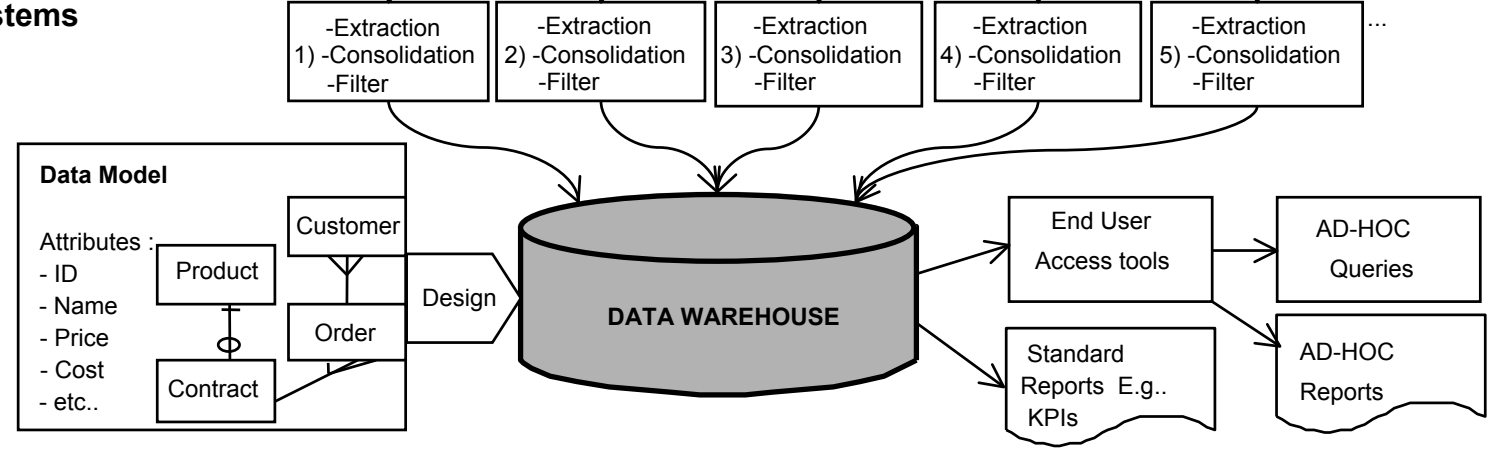
Production Systems

Optimized for :
-Speed
-Efficiency
-Operational processes
-Data capture
-Today
-Package implementation

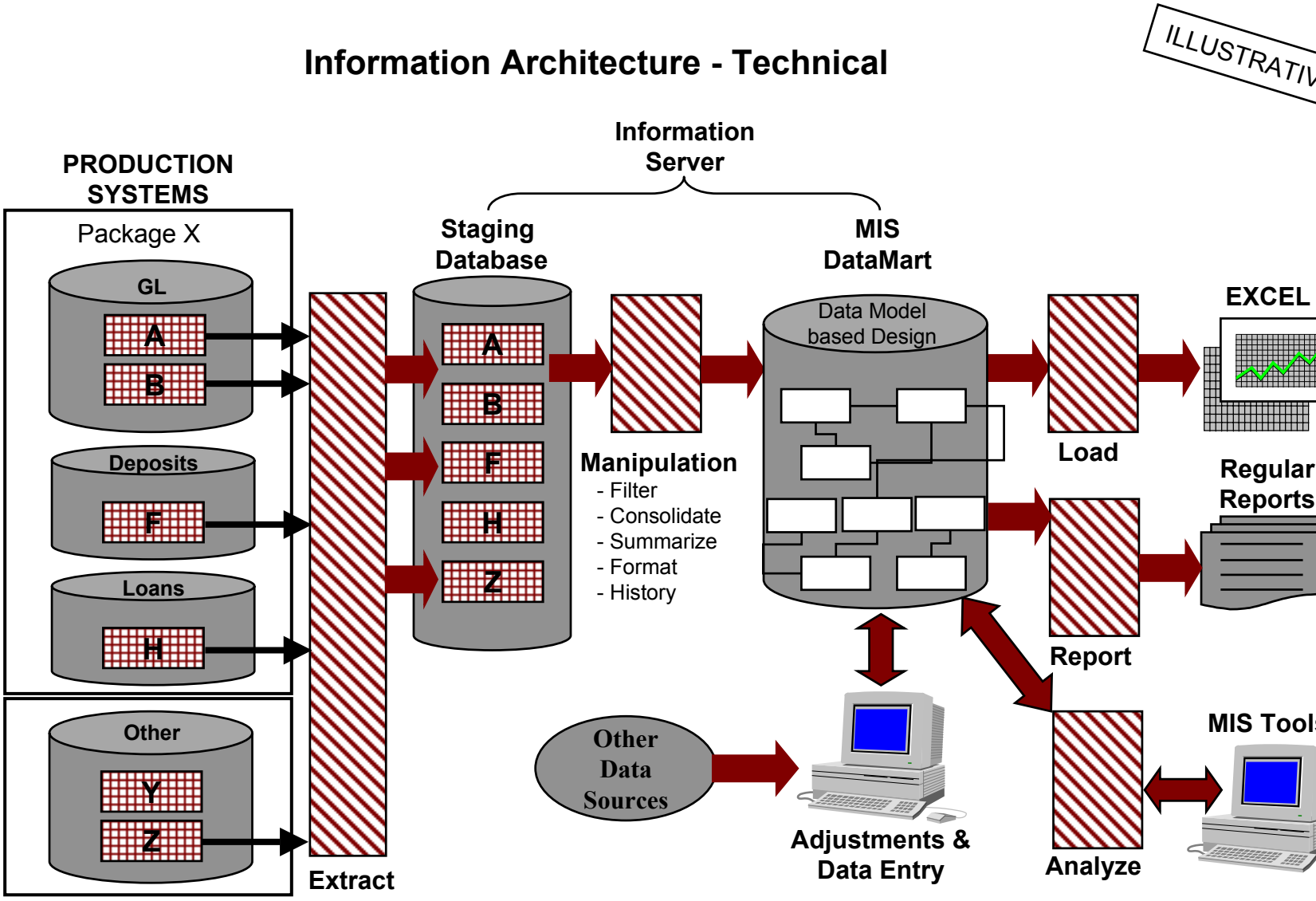


Information Systems

Optimized for :
-Information
-Flexibility
-History
-End user access
-In-house design & development



The information architecture will lead to a technical design and platform selection for the information systems



An information architecture attempts to answer strategic questions about the organization's critical information needs

- Strategic Questions:
  - What information is required?
  - Where is the information required?
  - When is the information required?
  - Who requires the information?
  - Where is the source of the information?
  - Who owns the information?
  - What is the criticality or priority of information?
  - What security is required?
  - How is the information best delivered?

To address the answers to the strategic information questions, the organization needs to take the questions to a planning level

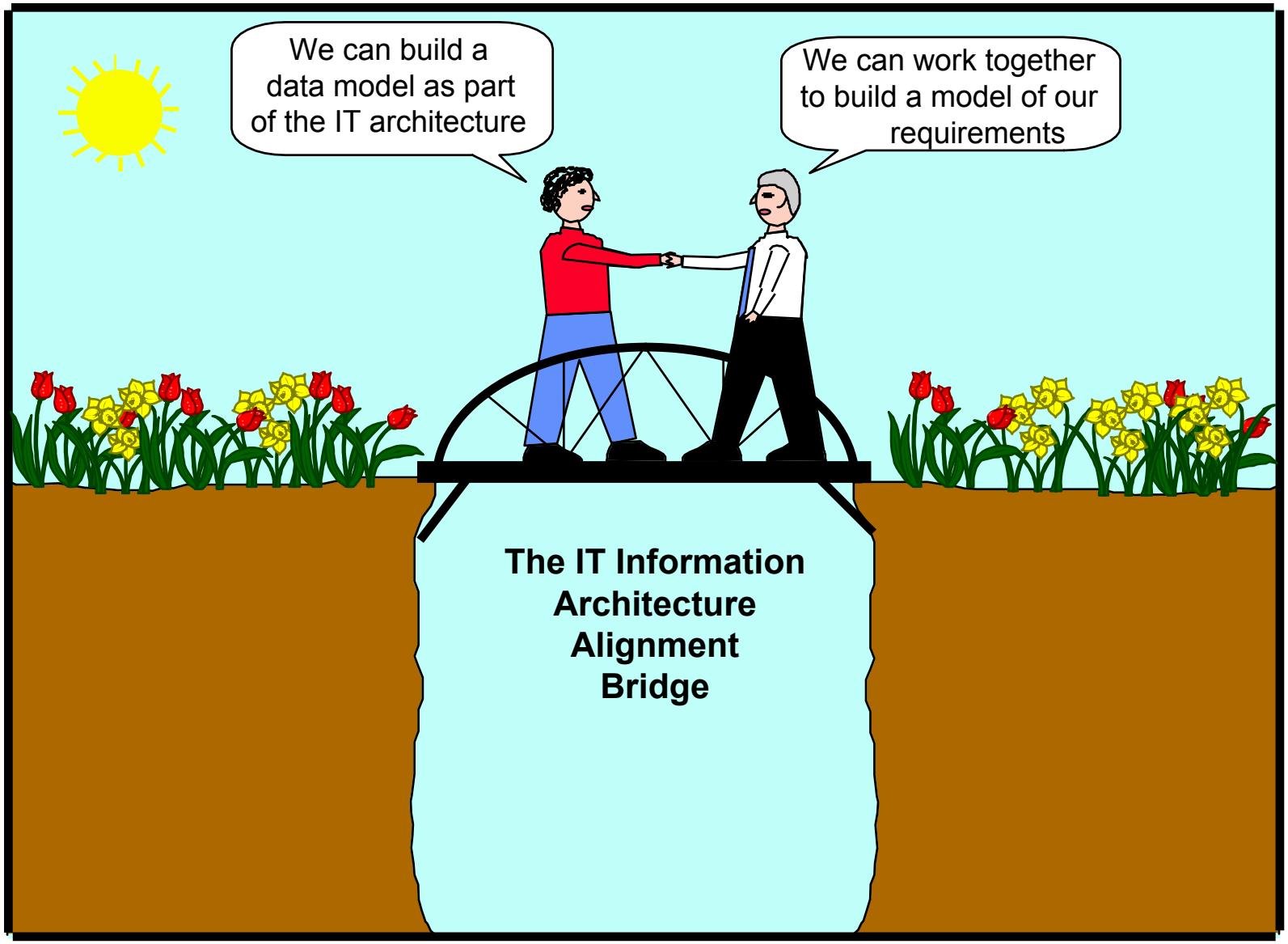
- Planning Questions:
  - What data is required to provide the information?
  - What business rules have to be observed in structuring data?
  - What is the frequency of data access?
  - Where is the data accessed?
  - What is the life-cycle of the data?
  - What are the volumes and expected growth rates?
  - Should data be distributed or centralized?
  - What data needs to be transaction oriented and what should be at a summary level?
  - What time increments should be built in to the database design (e.g. daily, monthly)
  - What history needs to be kept and at what level?

For the information architecture to be successful, the project must address some technical implementation questions

- Implementation Questions:
  - The content of specific data stores
  - The design of individual data stores
  - The physical placement of data stores
  - The design of routines to extract, sort, summarize and upload data
  - The design of processes to support the information systems
  - Skills and organization design required to create, maintain, populate and support the data stores
  - Security method and tools to control access to data stores

Some guiding principles for the information architecture have been derived from previous successful experiences

- Top-Down to ensure consistency and commonality
- Engineering discipline
- Deliverable focus, regular deliverable production
- Relentless management of scope
- Data architecture developed within a team work structure
- Relentless drive toward issue closure, no open issues left hanging
- Focused work teams
- Data models are not developed in isolation but by teams within the context of business processes
- Not academic, driven by data implications of business needs


We can build a data model as part of the IT architecture
We can work together to build a model of our requirements
The IT Information Architecture Alignment Bridge

Information Management

If the IT architecture identified many information needs, the organization needs to develop a stronger Data Management capability

Data Management Issues

1. The need to develop Data Management capability
   - A consistent data discipline practiced by all employees

2. No clear business project support of the direction for the data warehouse approach
   - KPI and other business initiatives are adopting short term approaches to meet immediate goals
   - Lack of a consistent view amongst stakeholders

3. Data quality and integrity is low
   - Many of the strategic business programs are highly dependent on good quality information (e.g. CRM, VBM)
   - Data quality in the organization appears to be low, with incorrect, out-of-date and missing data

4 A need for dependable source of quality data for the core banking systems

Organization:

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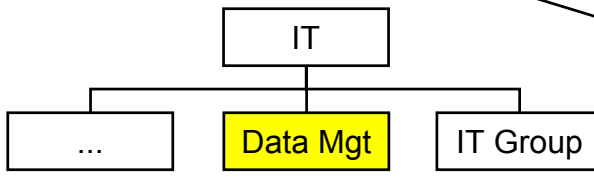
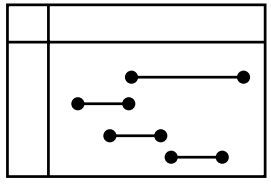
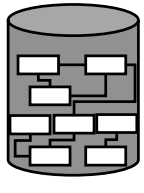


Process:



Data Management Proje
- Data discipline training
- Data sourcing/definitio
- Retail customer clean-u
- Data quality
- Data clean up
- Improve underlying sou data

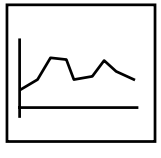
Tools:



Commercial Databases

Clean-up Agencies

- De-duplication
- Cleansing
- ...



- Hyperion
- Oracle Express
- DB2 OLAP
- SQL Server
- ...

The organization will need to to improve overall data quality by reducing the level of data entry errors

Hypotheses on causes of data entry errors

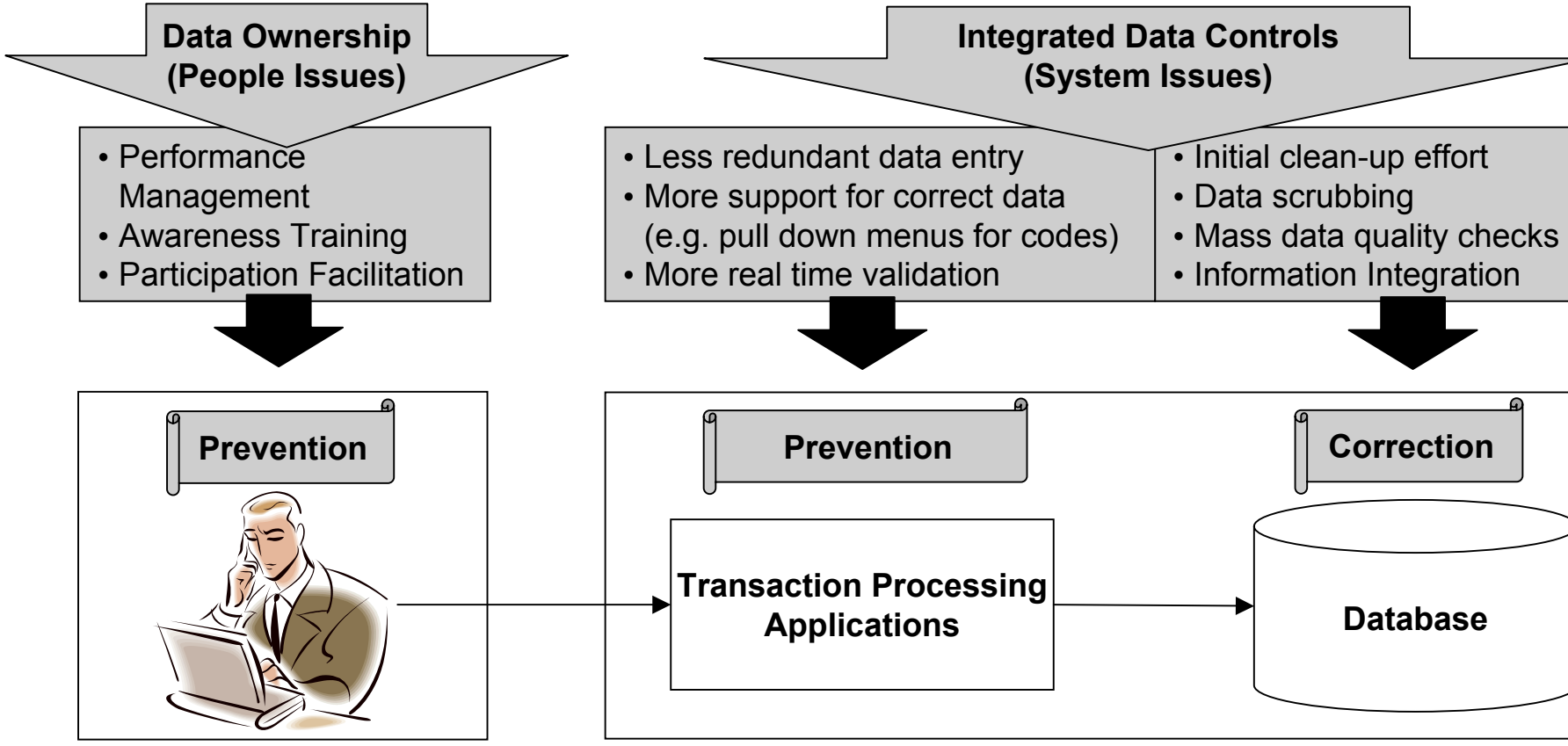
- Many users do not understand the importance of entering correct data
- Data quality is not one of the users' priorities
- Users are not given enough time to re-check their entries
- Over time, users have drifted to "entering the minimal amount of data to get the job done"
- The systems do not include sufficient real-time data integrity tests
- Users do not know how to enter data correctly
- Users do not know the right code to enter (e.g., difficulty in classifying the industry of loan applicants)

Proposed solutions

- Recognize Performance
  - Hire/assign the right people to the right jobs
  - Improve job satisfaction
  - Reward quality effort through formal recognitio programs
- Raise Awareness
  - Educate on the importance of quality work
  - Provide better job training if necessary
- Facilitate Participation
  - Feedback errors level regularly to highlight problems and facilitate improvements
  - Encourage users to suggest improvements

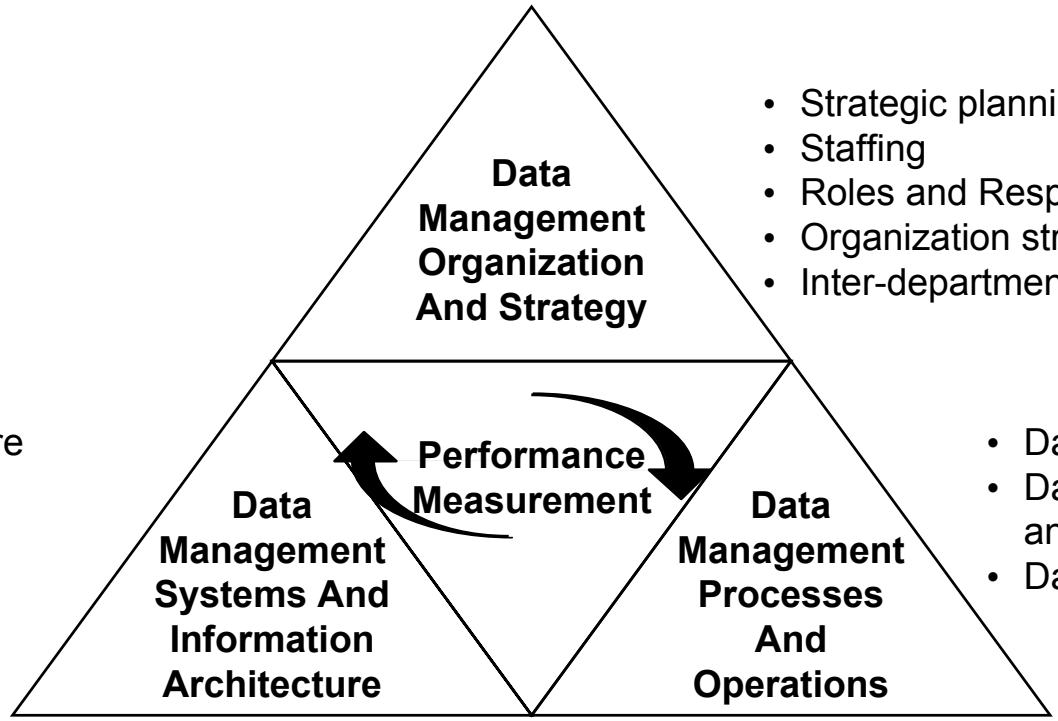
- Higher quality of data from reduced entry errors
- Improved quality of customer service
- More reliable information for decision making
- Higher efficiency from reduced repeat work

A comprehensive effort that addresses both people and system issues is required to improve customer data quality



There are four key elements of a fully integrated approach to information management

Data Management Framework



- Strategic planning
- Staffing
- Roles and Responsibilities
- Organization structure
- Inter-departmental coordination

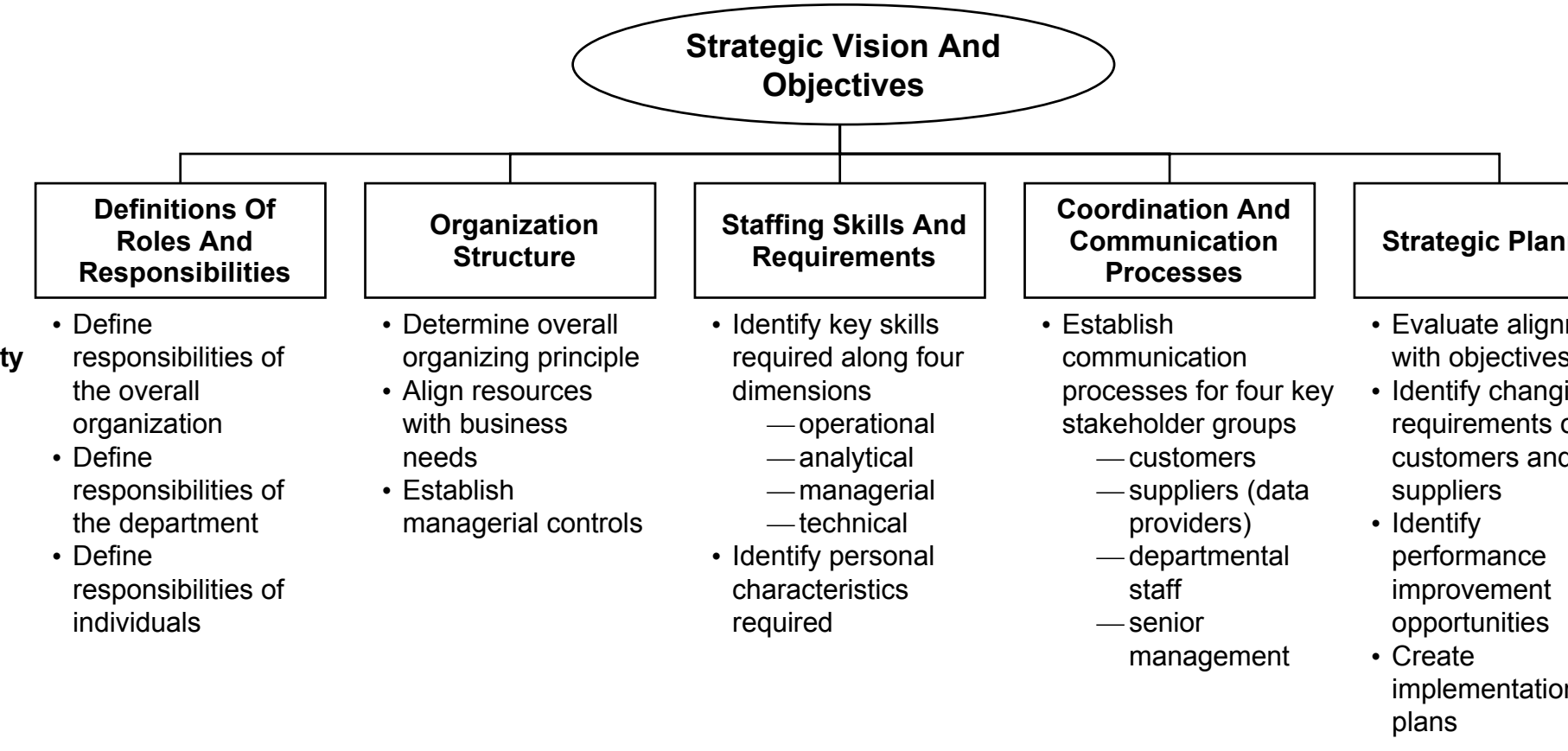
- Hardware/software
- Data capture and transmission
- End-user tools
- Data modeling
- Security

- Data collection
- Data processing and analysis
- Data dissemination

- Performance metrics
- Service charters

Data management organization and strategy revolves around five key areas, each of which must be addressed in the planning and design stag

Data Management Organization and Strategy Framework



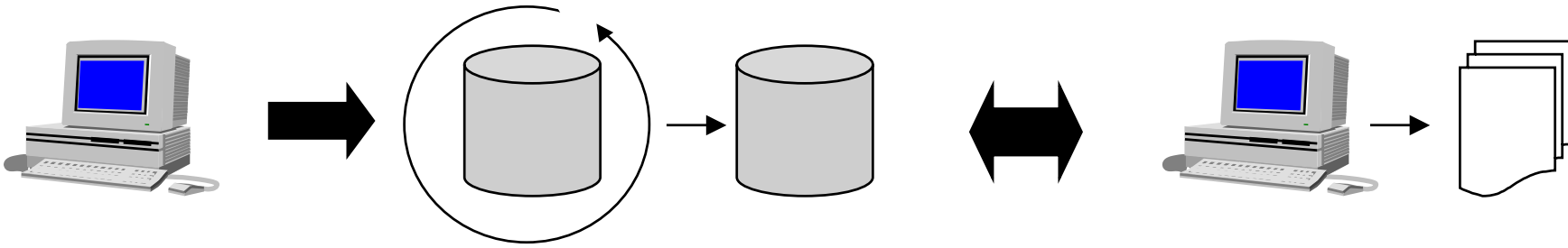
The second major area of focus is the data management process, which can be decomposed into three major components

Data Management Process and Operations

	Data Sourcing and Collection	Data Processing And Analysis	Data Dissemination
Key Process Element	• Determine data requirements • Determine existing sources of data • Design data collection format • Distribute format and instructions to data suppliers • Complete data entry/populate forms	• Develop data flow process • Review and verify quality of data • Correct inaccurate data • Compile data • Conduct analysis	• Identify key users • Determine dissemination schedule, format and medium • Assign responsibilities for dissemination • Disseminate data

A third major area of focus is systems and information architecture, which supports the entire data management process

Data Management Systems and Information Architecture



	Data Entry	*Transmission*	*Processing*	*Storage*	*Access*	*End User Tools*	*Publicati*
ues:	• Automate data entry to minimize manual intervention • Embed validation routines at the source of data entry • Develop means to update application as necessary • Format collections to facilitate multiple use	• Establish easy-to-use electronic transmission network • Provide adequate encryption tools • Ensure appropriate authorization prior to transmission	• Provide access for multiple processor staff • Conduct additional automated validation • Perform overall balancing of respondent data • Isolation of data during processing	• Create data model to reflect data linkages • Incorporate unique storage requirements of multiple users • Limit the number of physical databases	• Establish individual access and security controls • Manager user access rights	• Provide flexible tools for users to customize data queries • Ensure end user tools are easy to use	• Automate publication minimize n intervention

A major driver of process efficiency is the automation of data entry and validation

Data Entry

Key Issue	Key Success Factors
• Automation	• **Automate data entry to minimize manual intervention** • Establish clear and stable standards in order to minimize IT burden on data providers • Identify and communicate the level of technical support the Bank can provide • Support alternative means of data submission
• Validation	• **Embed validation routines at the source of data entry** • Provide clear definitions , instructions and validation formulas to data providers • Enable data providers to generate reports to review data in its output format • Include user prompts leading to field causing error
• Updates/changes	• Develop means to update application as necessary • Manage version control and application distribution to ensure comparability of data • Include ability to view old data
• Collection format	• Format collections to facilitate use by multiple users

Once validated, data must be transferred through a medium that meets security requirements

Transmission

Key Issue	Key Success Factors
• Ease of use	• Data transmission medium must provide easy, reliable access for data providers
• Encryption	• **Highly confidential data must be adequately protected**
• Authorization/Non-repudiation	• Identify the level of activity and access tracking required to meet audit needs • **Develop process to monitor authorization of data submitted concurrent with need**

Data processing should be guided by a structured verification routine

Processing

Key Issue	Key Success Factors
• Multi processor access	• Store raw files and in process files in a central location accessible to all processing sta • Include ability to handle multiple versions of data
• Separation of data	• Isolate data in a staging area during processing phase prior to being made available for analysis
• Automate validation	• Create programs to validate mathematical formulas and cross check values between re • Define plausibility parameters to flag possible errors • **Include soft-coded, formula driven verification rules**
• Balance all inputs	• Ensure aggregate flows balance • Facilitate coherent interpretation of changes in reported data

Once processed, data must be stored in a structure that facilitates analysis

Storage

Key Issue	Key Success Factors
• Data model/information architecture	• **Identify key relationships between data elements** • **Identify key business requirements of users and their impact on data storage and retrieval**
• Physical location	• Minimize the number of physical locations required for data storage to reduce storage requirements and replication

Access must be granted to the appropriate staff in order to maximize the insights drawn from collected data

Access

Key Issue	Key Success Factors
• Access rights	• Establish a transparent process for reviewing and granting access rights • Establish a process for updating access rights as positions change • Establish a single point of accountability for controlling access rights • Establish user types and allocate on a mass basis • **Manage access rights on the basis of roles not individual**
• Audit trails	• Agree upon the level of oversight required in monitoring data usage at the individual l

End user tools must be available to encourage users to structure and execute data queries needed to support analysis

End User Tools

Key Issue	Key Success Factors
• Flexibility	• **End user tools must provide sufficient flexibility for users to customize data form** • Analytical tools must support export of data for use with other tools (e.g., Excel) • Identify user friendly end user access tools
• Ease of use	• Provide sufficient training and support to encourage and user adoption

Publication of data should be automated so as not to distract resources from the key activities of data collection, processing and analysis

Publication

Key Issue	Key Success Factors
• Automation	• **Minimize formatting requirements** • Make data available electronically in downloadable format • Incorporate straight through processing

Finally, performance measures must be established in order to focus management attention on increasing the value the department provides to its customers and data providers

Performance Measures

Key Issue	Key Success Factors
• Identify departmental measures of performance quality	• Select quantifiable measures • **Identify measures that drive customer satisfaction, efficiency or value-added**
• Evaluate performance relative to stated measures	• Calculate performance at regularly scheduled intervals
• Incorporate deficiencies into performance improvement objectives	• Establish and maintain individual accountability for meeting performance targets

Information Management Organization

Development of the Data Management Department and changes to processes impacting data management should be guided by several underlying principals

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Guiding Principles for Information Management
• Wherever possible, activities related to data management will be **centralized** to ensure high levels of coordination, consistency and standardization • The Data Management Department will be **proactive** in planning for and executing data collection requirements of executives • Data belongs to the organization, not any individual department. Unless otherwise specified, data will be **accessible** to any user with appropriate security clearance • Data management must be **flexible** in adapting to changes in both technology and user needs • Data management shall be **customer service oriented** and **user driven** • Collection of data will be driven by users' **actual information needs** • Wherever possible, data management will be facilitated through the use of **technology**

The Data Management unit should focus on and be accountable for several key objectives

Objectives of Data Management Unit

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Overall Objective	Detailed Objectives
1. Improve Data Collection Process	• Reduce the amount of data collected to include only information needed to support decision making • Support the automation of data collection • Simplify and standardize the data collection process, including format, content, timing and follow-up with data providers • Coordinate data needs among users to reduce redundant requests
2. Ensure Quality of Data Management Process	• Ensure accuracy and authenticity of and accountability for data • Clarify data definitions • Ensure timeliness of data availability • Create a well structured data warehouse • Ensure data is adequately secured and backed-up • Dynamically plan for and develop future data management requirements
3. Improve Data Dissemination Process	• Standardize presentation formats • Improve coordination among users to ensure maximum usage of collected data • Improve access to data among appropriate users • Support users in identifying and retrieving needed data in a user-friendly format

Organizations are moving towards three separate roles in knowledge and information management

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Chief Technology Officer	Chief Information Officer	Chief Knowledge Officer
• Focus on the processing and technical needs of the organization • Builds and manages the core processing applications • Builds and manages the technical infrastructure, including the communications network • Runs the data processing and information storage centers • Strong technical skills required • Deep understanding of the core organization's processes • Often manages an outsourcing contract	• Focus on the information needs of the organization • Deep understanding of the key decision-making processes in the organization • Builds and manages the data warehouse and data marts • Keeps the information architecture up-to-date • Provides some data analysis and reporting skills • Trains the end users in the data access tools and the structure and content of the databases • Sources much of the data from the Chief Technology Officer	• Focus on the knowledge needs of the organization • Much "softer" role than the CIO and CTO • Fosters a learning organizatio environment • Sponsors the capture and dissemination of knowledge • Facilitates communication forums between key knowledge workers • Uses very unstructured technology tools

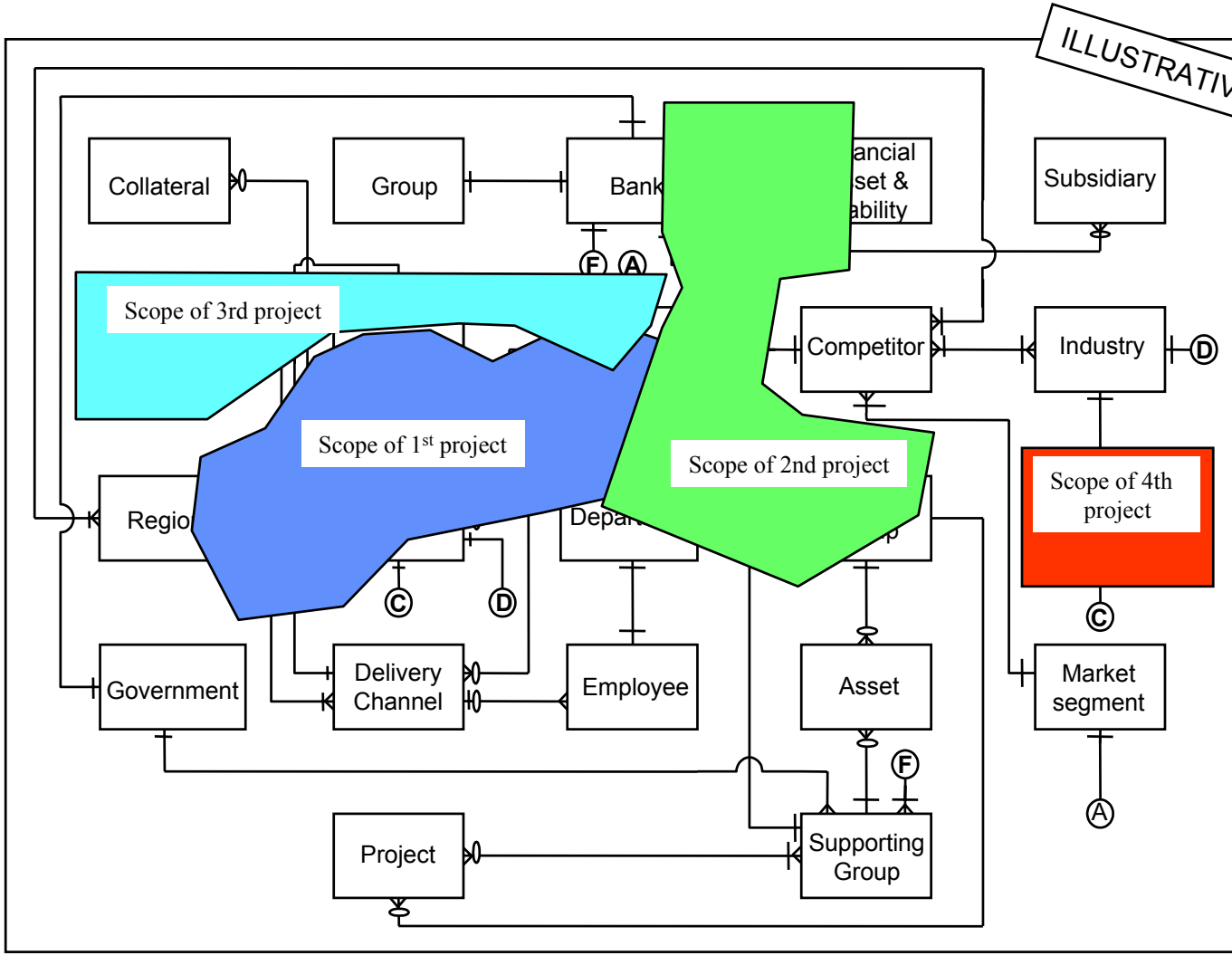
Degree of Structure in Role

Information Management Implementation

Implementation of data management systems should be done in small pieces, driven by defined business requirements with a strong sponsor

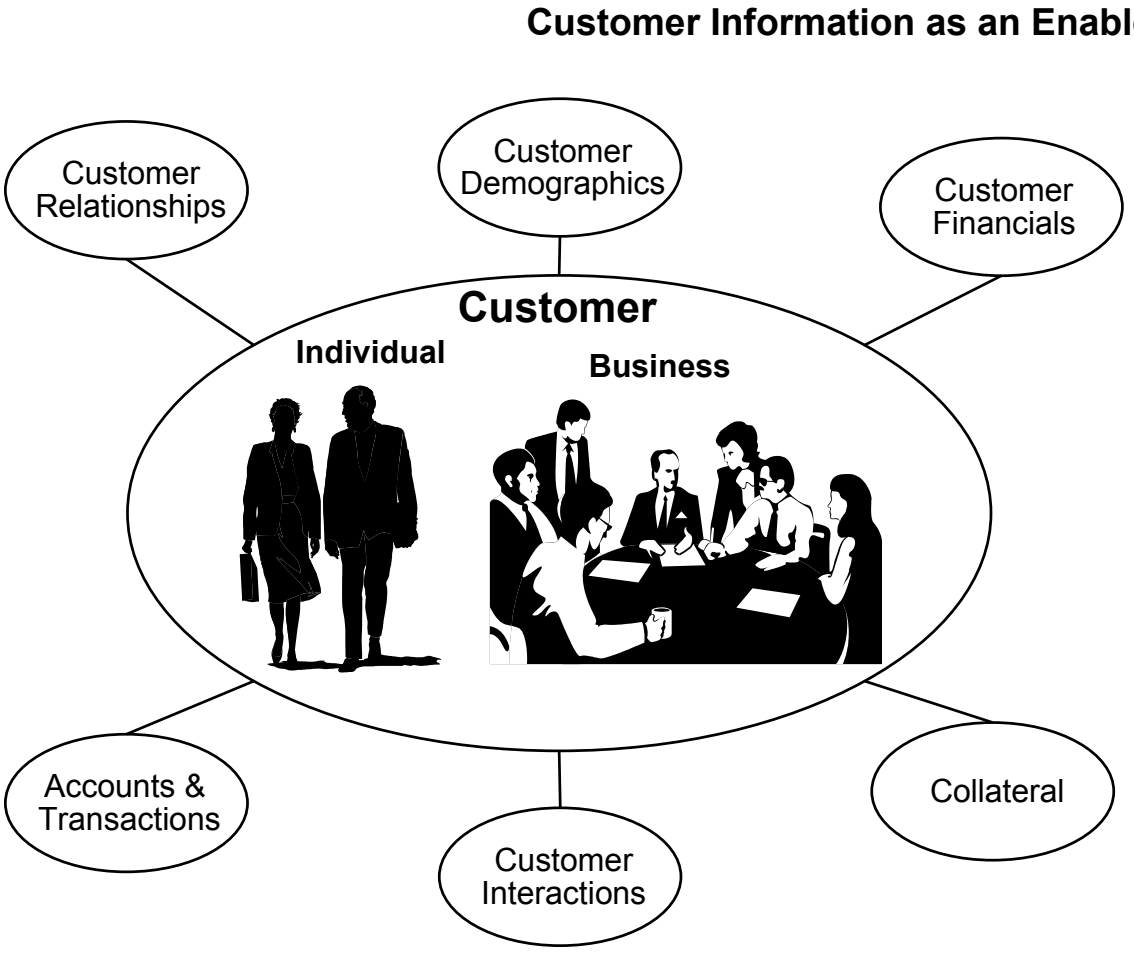
Implementation

- Develop the overall target information architecture first
- Series of projects each with a relatively well-defined business scope
- Each project should be small enough to be successful within a defined time frame (e.g. < 6 months)
- Clear business sponsor with an understanding of their information requirements
- Each project populates a significant part of the data model
- All projects contribute to the development of the overall model



Example - Credit Risk Management Data Warehouse

An integrated view of customers is critical for conducting various business capabilities - including credit risk management



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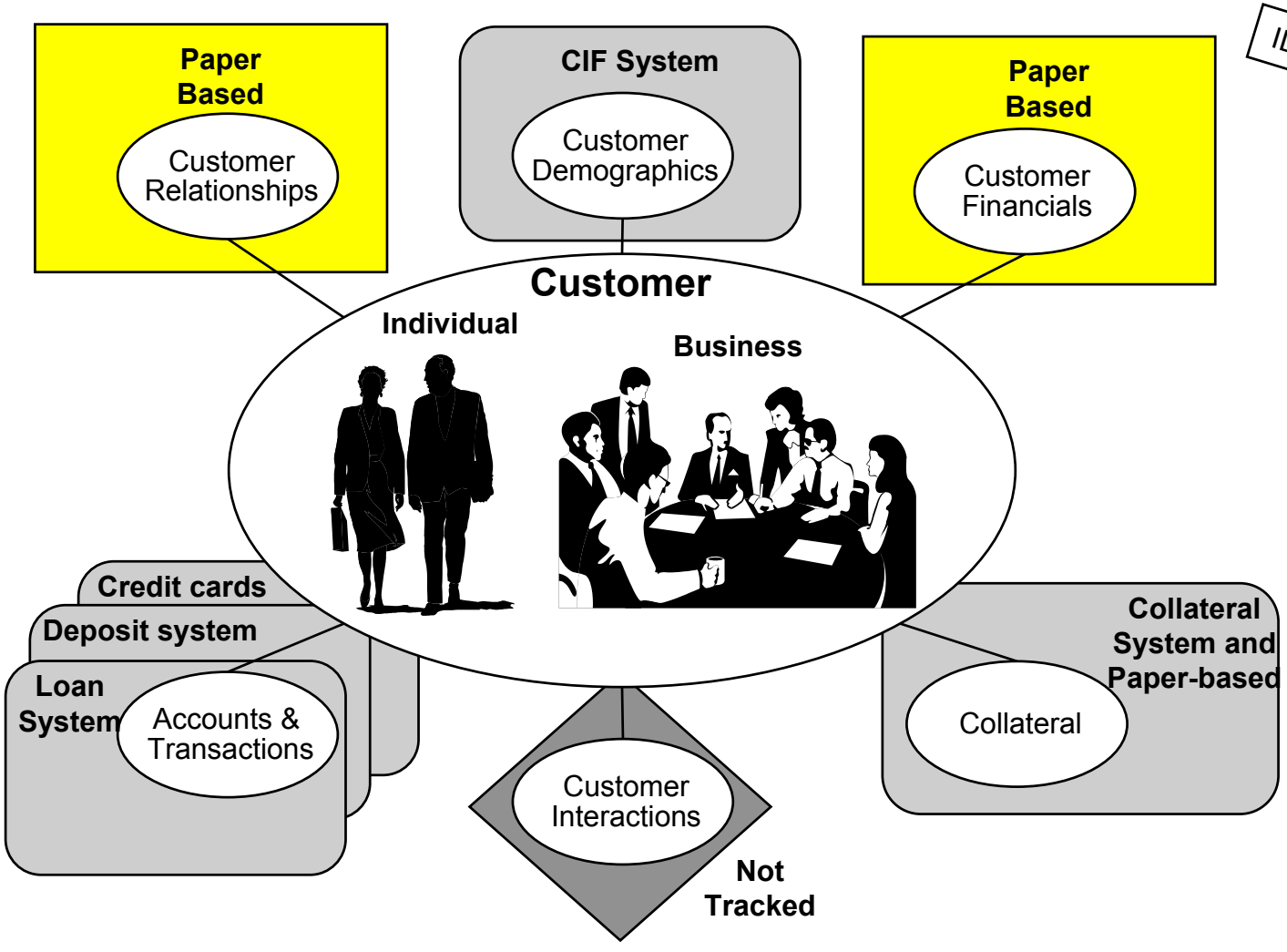
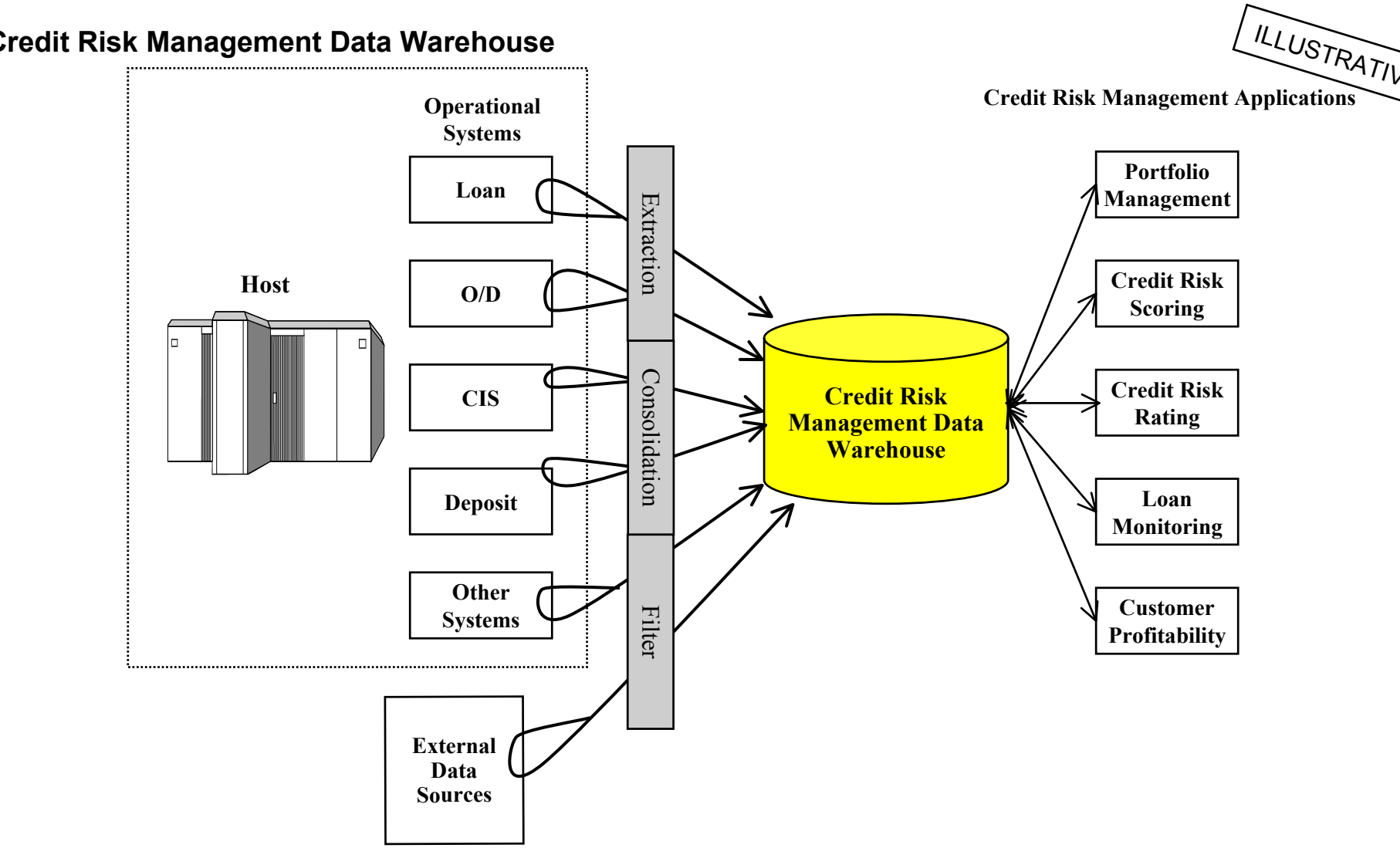
Business Capabilities
• **Credit risk management**
• Strategic marketing
• Product design and introduction
• Asset / Liability managem
• Regulatory and management reporting
• Profitability analysis
• Performance managemer
• Others

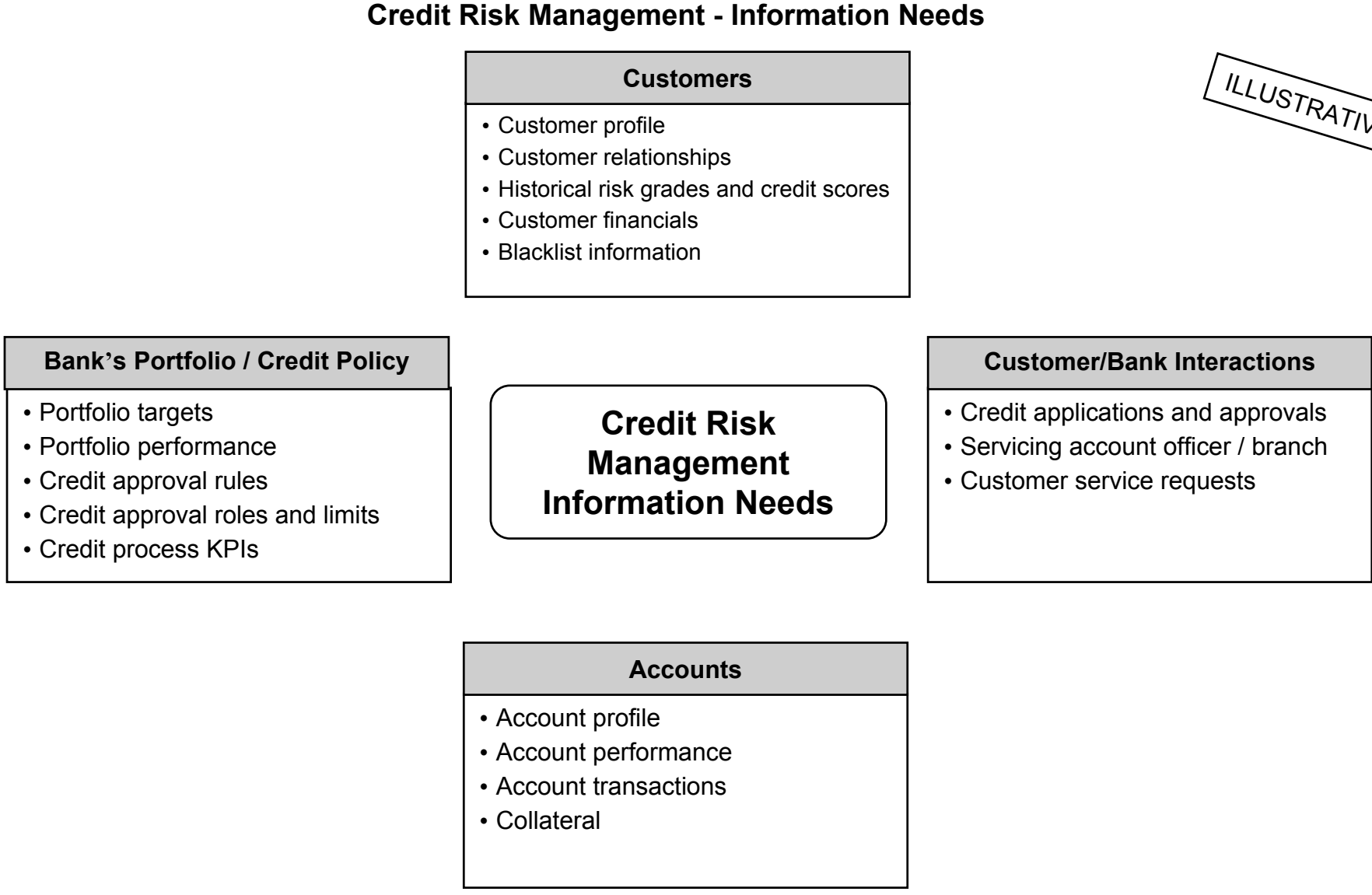
Integrating customer information is challenging since it is originally found across multiple operational systems - or worse yet, on paper or n tracked at all



The data warehouse will support credit risk management applications by integrating information found in multiple operational systems and other external sources



Credit risk management information can be classified into four major categories



The data warehouse market has evolved in recent years to provide a viable response to the issues in deploying both data marts and large-scale data warehouses

Multi-Tier Data Warehouses

Compatible data marts are implemented in phases utilizing a common banking data model

Reduces implementation risks while ensuring future compatibility for enterprise-wide requirements

Data Marts

Single-subject, departmental decision-support environments that can be deployed quickly and at a lower cost

But...

They can proliferate into a collection of incompatible data stores with utility limited to the department that designed them in the first place

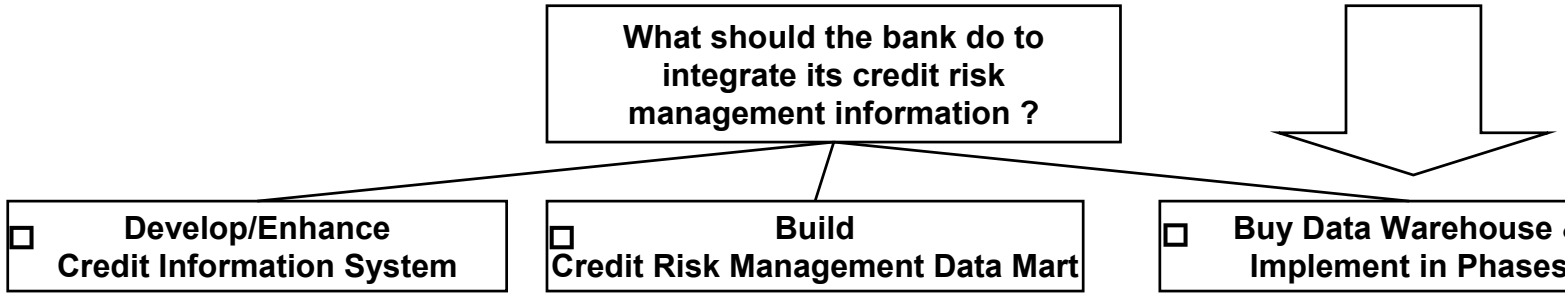
Large-scale Data Warehouses

Usually an enterprise-wide effort that seeks to integrate data from most transaction sources

But...

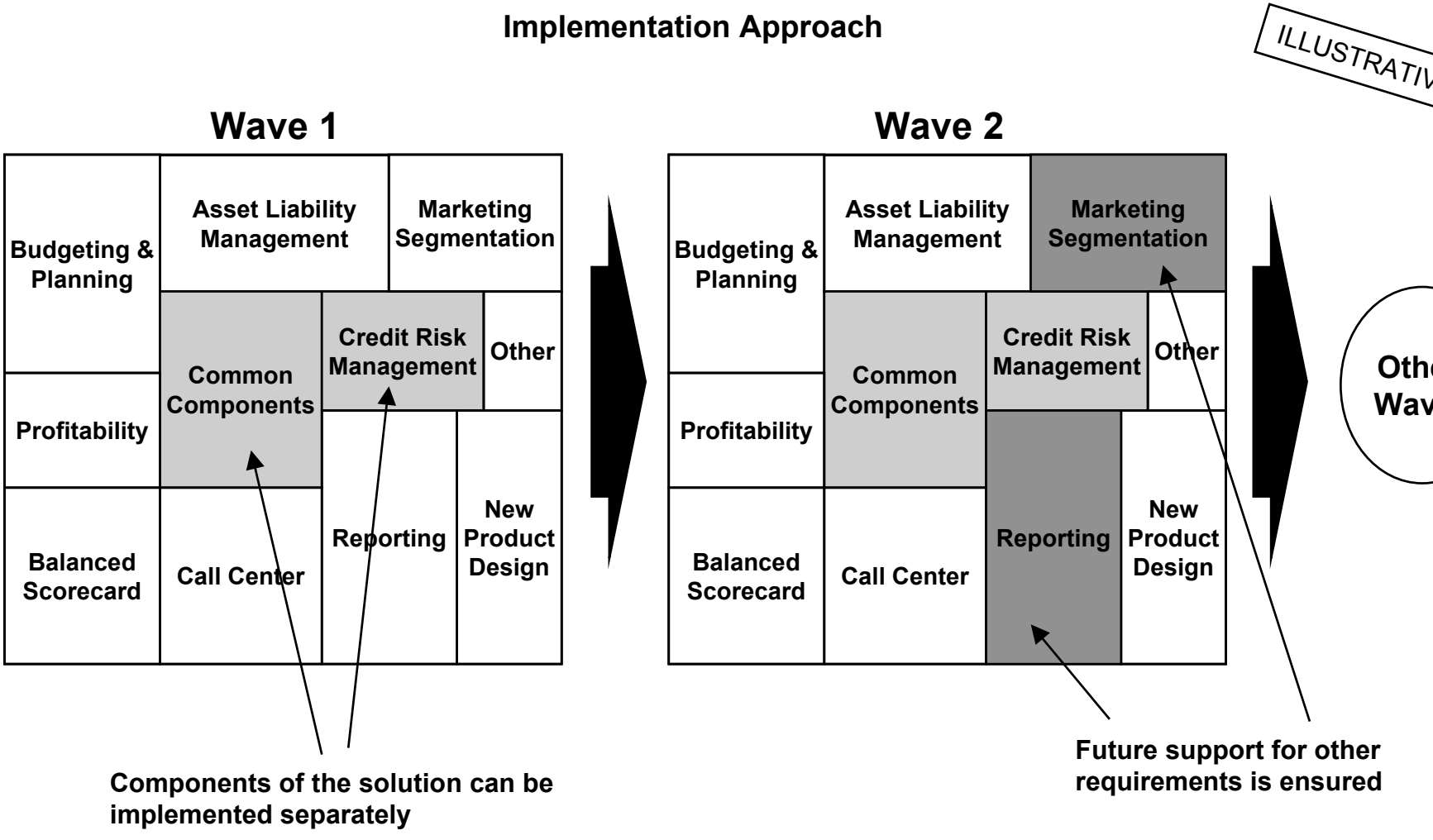
Significant risks due to large investment, complexity and long lead time have resulted in many failures

Various implementation options for Credit Risk Management data warehouse have been proposed. Strengths and weaknesses for each option have also been identified



	Develop/Enhance Credit Information System	Build Credit Risk Management Data Mart	Buy Data Warehouse & Implement in Phases
Option Description	Improve both functionality and content (e.g., add deposit information) of the credit information system	Build a custom credit risk management data warehouse using both internal and external resources	Buy a banking data warehou a software vendor and imple phases
Strengths	• Utilizes current interfaces with transaction systems • IT staff has experience with technology	• Design is specifically tailored to the bank's credit risk management requirements	• Time and effort are reduce using the vendors' banking model • Can support other bank capabilities (e.g., market segmentation, etc.) • Reduces implementation ri
Weaknesses	• Current platform is not stable or complete • Long-term migration options are uncertain • Not integrated with retail data warehouse efforts	• Long lead time to deploy due to size of effort to develop a data model and database design from scratch • Requires significant IT and business skills • Difficulty to integrate in the future with other bank's data marts	• Requires additional progra management skills to coord with vendor • Higher initial software and implementation cost

In order to reduce implementation risks and achieve earlier results, implementing components of data warehousing solution should be conducted in various waves



Conclusions and Key Messages

- Knowledge management is still at the “early adopters” stage but world class organizations are pushing themselves up the learning curve
- Information management is migrating from the “art-form” to “engineering principle” stage and success stories are quite common
- Data management is an engineering discipline and should be practiced by all quality organizations
- An information architecture, often performed as part of an overall IT architecture or strategy, is the essential first step to success
- Separate approaches are required for production (processing) and information systems
- Organization design should include separate CKO, CIO and CTO roles and units
- Implementation success is more certain from a wave or phased approach, with the initial projects selected for their achievability
- Strong senior sponsorship and support is required
- All the usual change management challenges apply….