

COMM1822

Term 2 2022

Introduction to Databases for Business Analytics

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Week 7 Database Development Process

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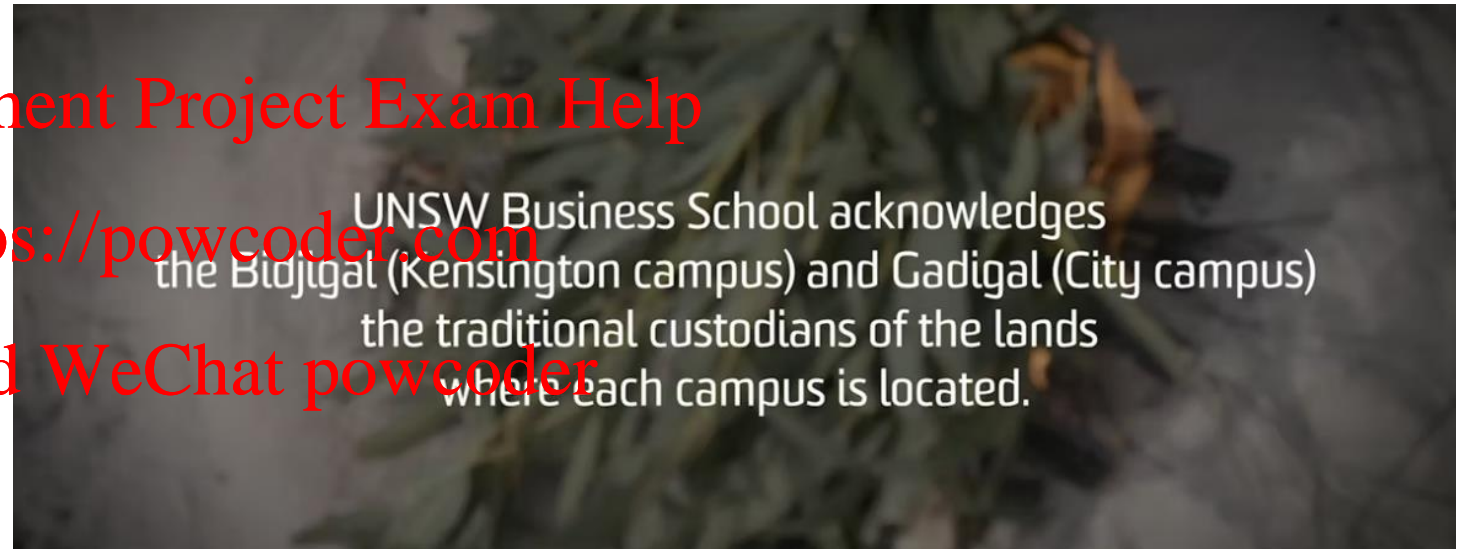
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We acknowledge all Aboriginal and Torres Strait Islander Elders, past and present and their communities who have shared and practiced their teachings over thousands of years including business practices.

We recognise Aboriginal and Torres Strait Islander people's ongoing leadership and contributions, including to business, education and industry.



UNSW Business School. (2022, May 7). *Acknowledgement of Country* [online video]. Retrieved from <https://vimeo.com/369229957/d995d8087f>

At UNSW
you are
free to...



Respectfully
disagree about
anything



Express different
opinions



Write your
beliefs



Show your
beliefs



Leave any club
or organisation



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It's not
acceptable
to...



Attempt to
censor opinions



Use hate
speech



Make threats
or instil fear



Make false
accusations



Access or share
others private
information
without consent

We are
here to
help...



Tell a
teacher



Tell UNSW
Psychology
and Wellness



Report to
UNSW
Complaints



Report
to UNSW
Security



Report a
crime to
police



Find
out
more

W7 Learnings Outcomes

Business Intelligence

Database Development

- ☐ Information systems development overview
- ☐ Software development lifecycle (SDLC)
- ☐ Database development lifecycle (DBLC)
- ☐ Interaction between SDLC and DBLC

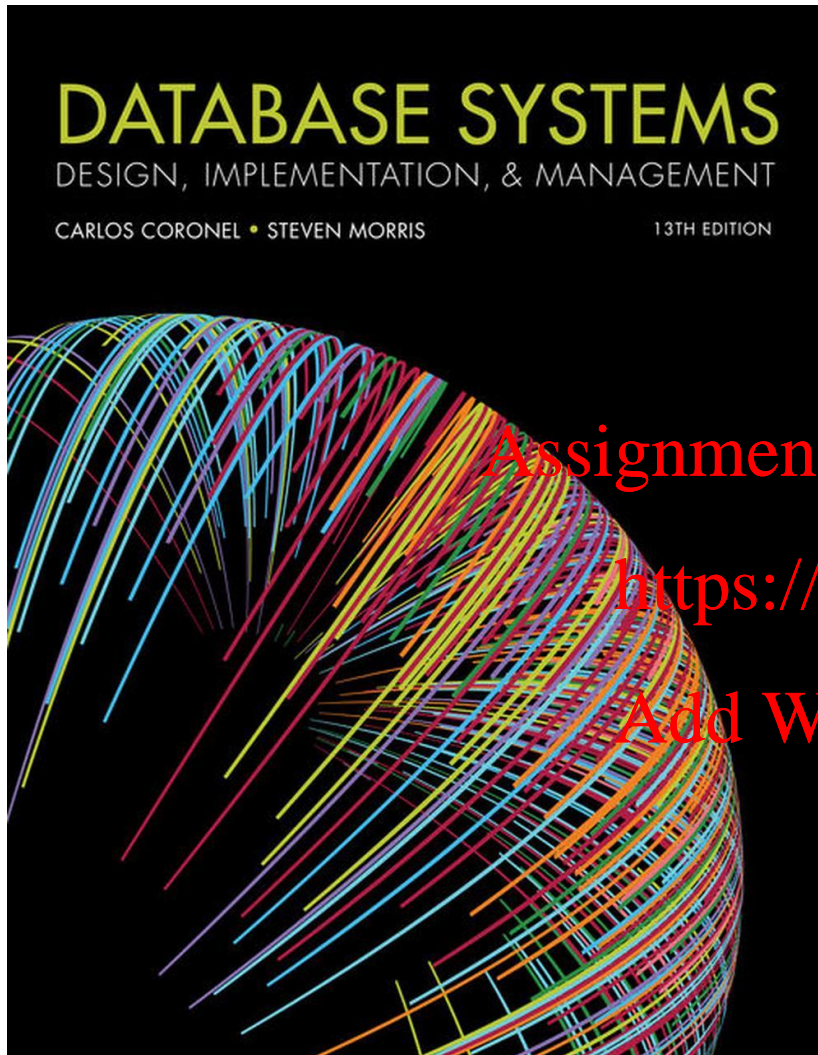
Database Professional Roles

- ☐ Database Administrator (DBA) vs. Data Administrator (DA)
- ☐ DBA tasks
- ☐ DBA ethics

Business Intelligence (BI)



Source: cio.com



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Chapter 13

Business Intelligence and Data Warehouses

13-1 to 13-2

Business Intelligence (BI)

Comprehensive, cohesive, integrated set of tools and processes

- ❑ Captures, collects, integrates, stores, and analyzes data
- ❑ Generates and presents information to support business decision making

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Allows a business to transform:



Business Intelligence (BI)

Concepts, practices, tools and techniques to help business

- ❑ Understand its core capabilities
- ❑ Provide snapshots of the company situation
- ❑ Identify key opportunities to create a competitive advantage

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Provides a framework for

- ❑ Collecting and storing **operational data** and aggregating it into decision support data
- ❑ Analyzing **decision support data** and presenting generated information to end users to support business decisions
- ❑ Making **business decision** which generates more data
- ❑ Monitoring results to evaluate outcomes and predicting future outcomes with a high degree of accuracy

“

Maintaining vs. revolutionizing

Business Intelligence is needed to run the business while Business Analytics are needed to change the business.

BI is focused on creating operational efficiency through access to real time data enabling individuals to most effectively perform their job functions. BI also includes analysis of historical data from multiple sources enabling informed decision making as well as problem identification and resolution.

Business Analytics relates to the exploration of historical data from many source systems through statistical analysis, quantitative analysis, data mining, predictive modeling and other technologies and techniques to identify trends and understand the information that can drive business change and support sustained successful business practices.

Source: <https://www.betterbuys.com/bi/business-intelligence-vs-business-analytics/>

Business Intelligence (BI)
vs.
Business Analytics (BA)

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Pat Roche

Vice President of Engineering, Noetix Products

Magnitude Software

Understanding the past versus the future

To me the difference between Business Intelligence is looking in the rearview mirror and using historical data from one minute ago to many years ago. Business Analytics is looking in front of you to see what is going to happen. This will help you anticipate in what's coming, while BI will tell you what happened. This is a very important distinction as both will provide you with different, non-less, insights. BI is important to improve your decision-making based on past results, while business analytics will help you come forward and understand what might be going to happen.

Source: <https://www.betterbuys.com/bi/business-intelligence-vs-business-analytics/>

Business Intelligence (BI)
vs.
Business Analytics (BA)



Mark van Rijmenam
CEO / Founder
BigData-Startups

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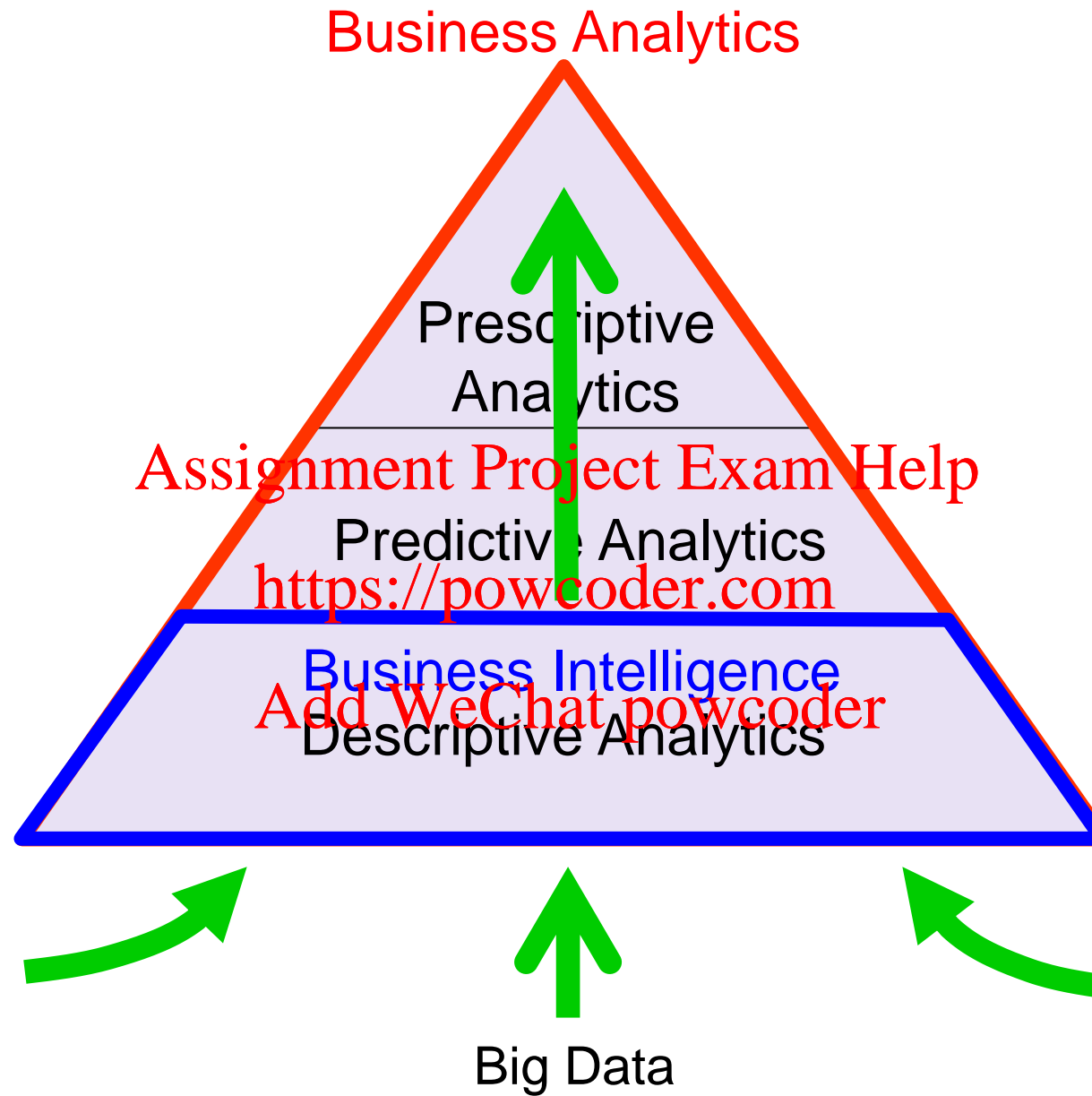


FIGURE 13.1 BUSINESS INTELLIGENCE FRAMEWORK

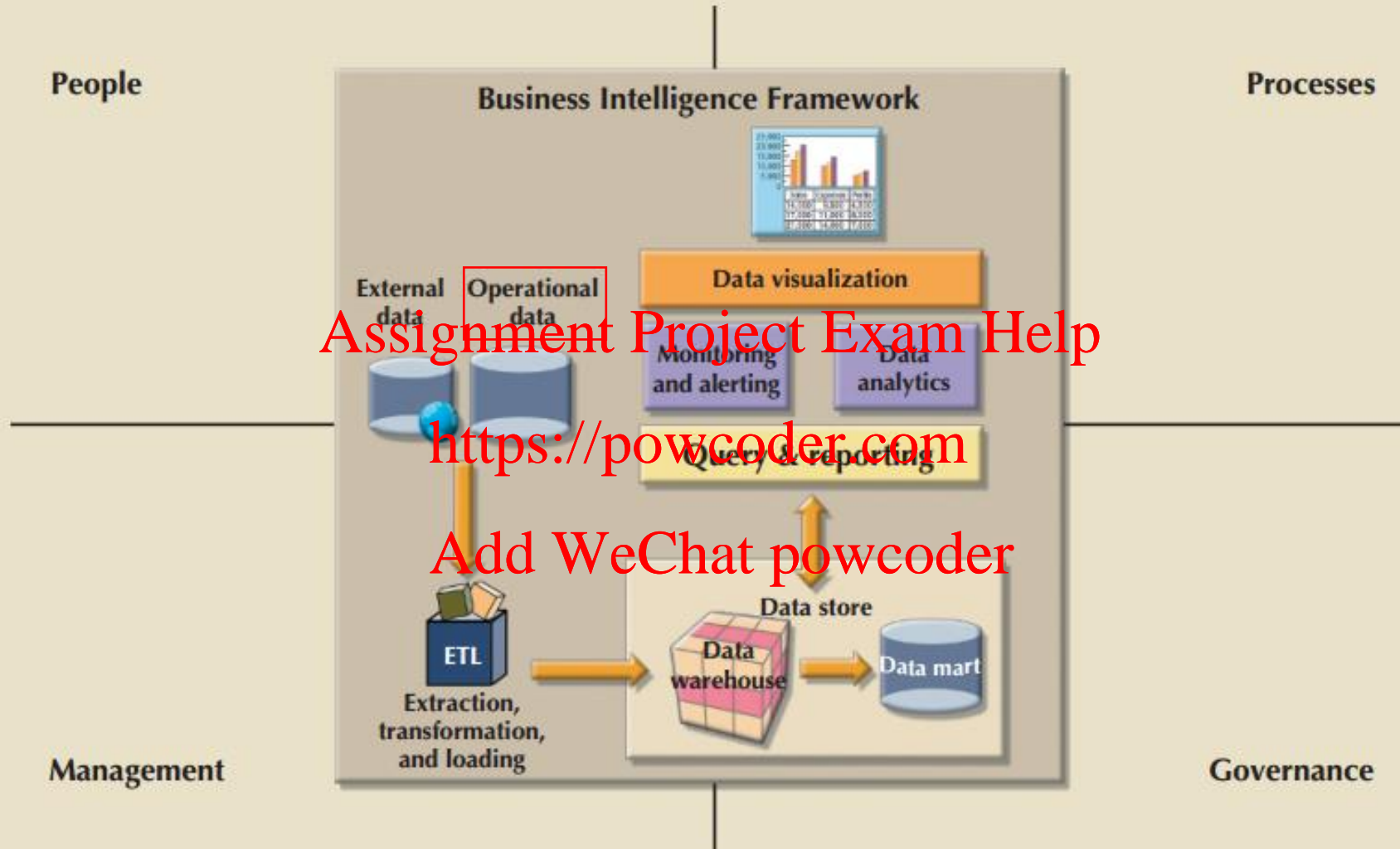


TABLE 13.3

SAMPLE OF BUSINESS INTELLIGENCE TOOLS

TOOL	DESCRIPTION	SAMPLE VENDORS
Dashboards and business activity monitoring	Dashboards use web-based technologies to present <u>key business performance indicators</u> or information in a single integrated view, generally using graphics that are clear, concise, and easy to understand.	Salesforce IBM/Cognos BusinessObjects Information Builders iDashboards
Portals	Portals provide a unified, single point of entry for information distribution. Portals are a web-based technology that use a web browser to integrate data from multiple sources into a single webpage. Many different types of BI functionality can be accessed through a portal.	Oracle Portal Actuate Microsoft SAP
Data analysis and reporting tools	These advanced tools are used to query multiple and diverse data sources to create integrated reports.	Microsoft Reporting Services MicroStrategy SAS WebReportStudio
Data-mining tools	These tools provide advanced statistical analysis to uncover problems and opportunities hidden within business data. Chapter 14 covers data mining in more detail.	SAP Teradata MicroStrategy MS Analytics Services

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TABLE 13.3

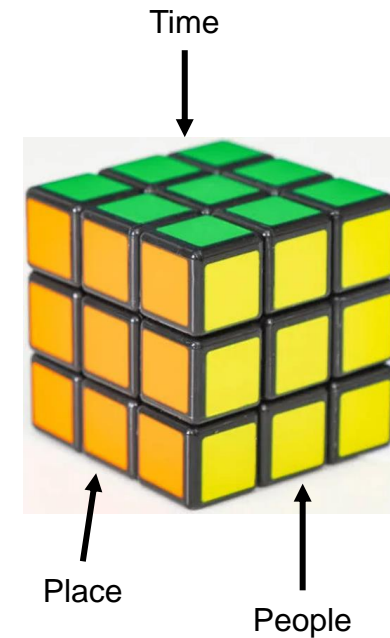
SAMPLE OF BUSINESS INTELLIGENCE TOOLS

TOOL	DESCRIPTION	SAMPLE VENDORS
Data warehouses (DW)	The data warehouse is the foundation of a BI infrastructure. <u>Data is captured from the production system and placed in the DW on a near real-time basis. BI provides company-wide integration of data and the capability to respond to business issues in a timely manner.</u>	Microsoft Oracle IBM/Cognos Teradata
OLAP tools	<u>Online analytical processing provides multidimensional data analysis.</u>	IBM/Cognos BusinessObjects Oracle Microsoft
Data visualization	These tools provide advanced visual analysis and techniques to enhance understanding and create additional insight of business data and its true meaning.	Dundas Tableau QlikView Actuate

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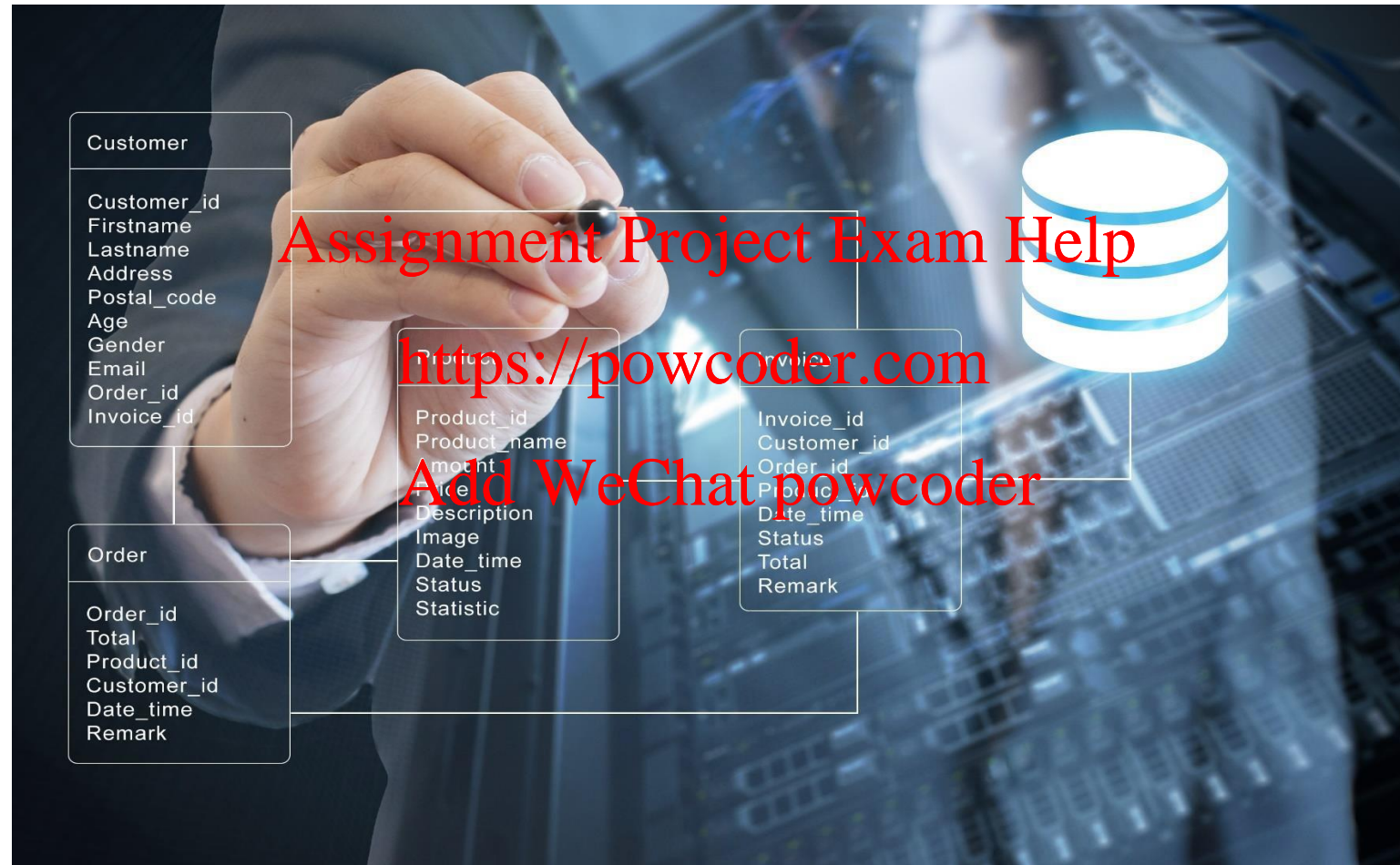
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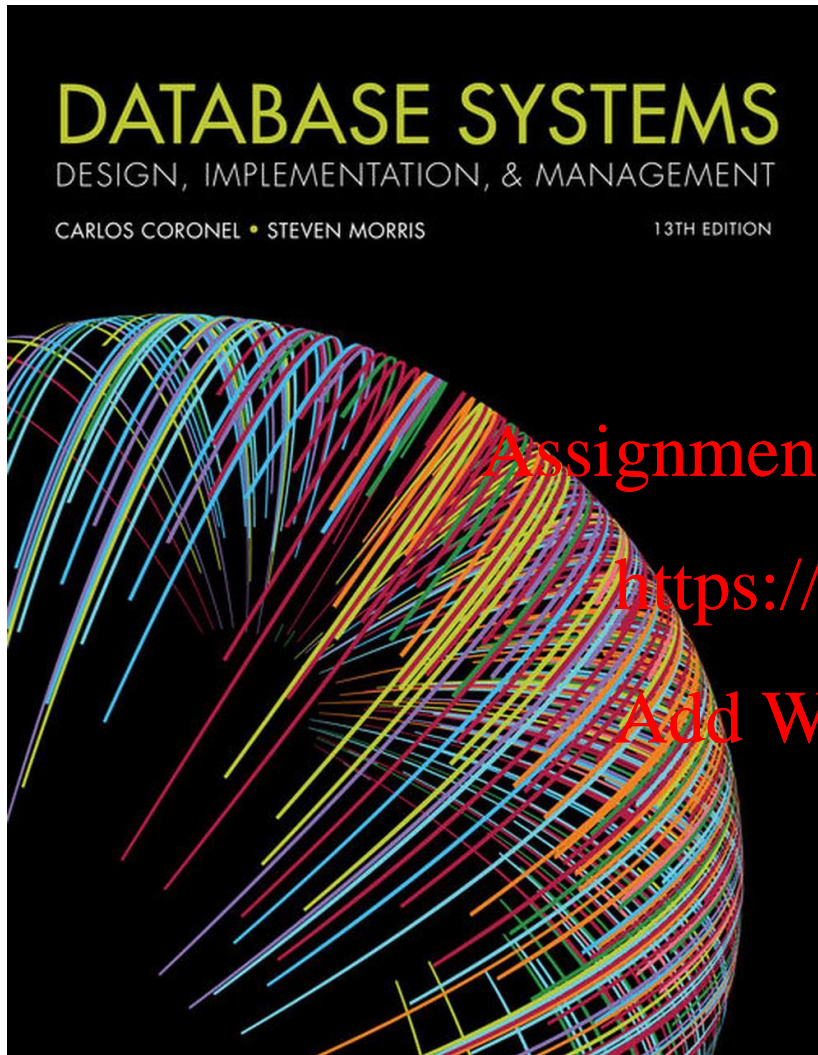


A **dimension** is a structure that categorizes facts and measures in order to enable users to answer business questions. Commonly used dimensions are people, products, place and time.

Database Development



Source: datadesignsystems.com



Chapter 3
Database Design
9-1 to 9-3

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Information Systems

Information Systems (IS) are systems that use IT to capture, transmit, store, retrieve, manipulate or display **information** used in one or more business processes.

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Important issues when building IS:

- ☐ The system must **solve the right problem**.
- ☐ The system must be **built in the most effective way**.
- ☐ The system must **fit into the existing environment**.
- ☐ The system must **be easy to use** (e.g., smartphone).

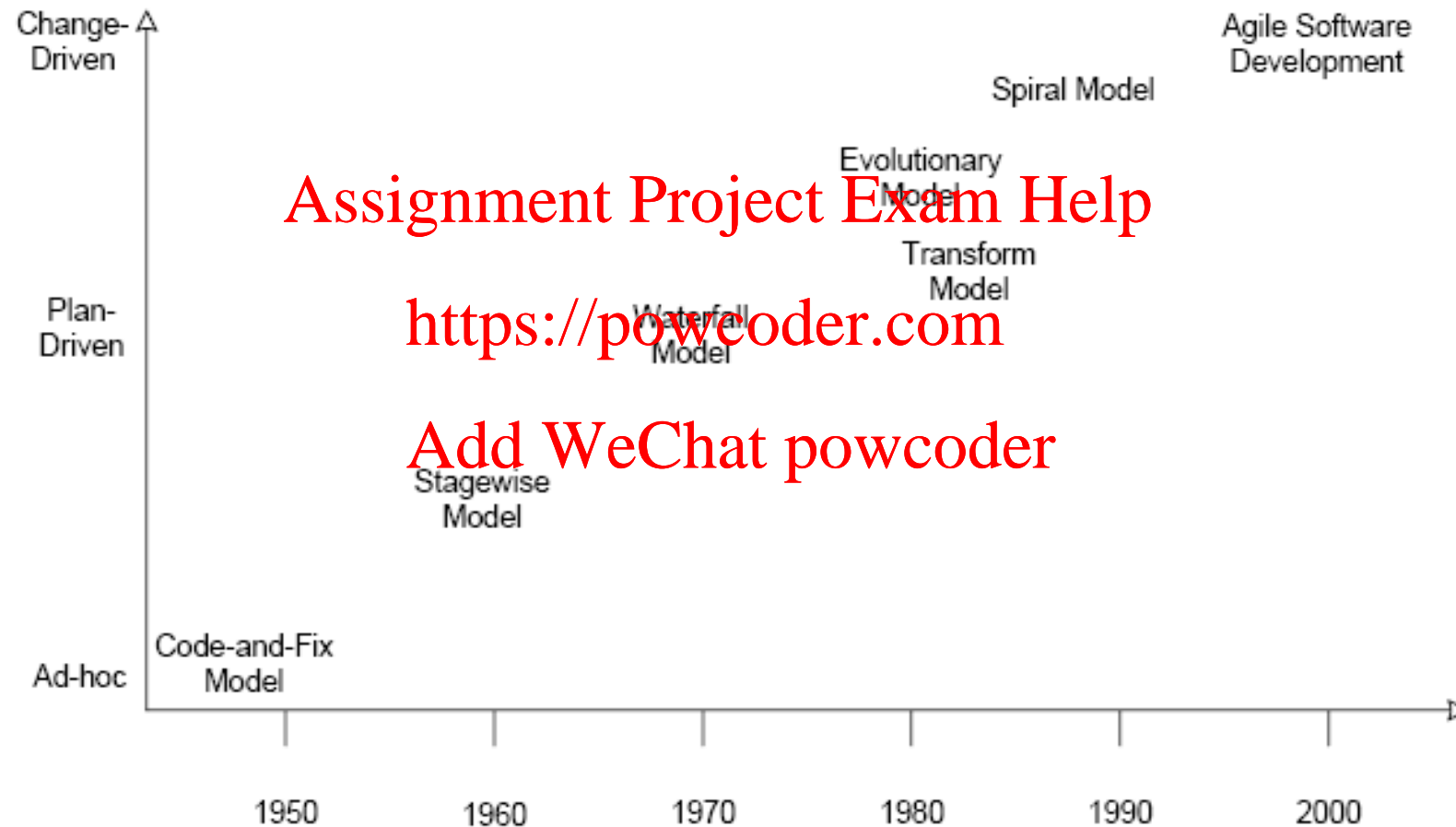
The performance of an IS depends on several factors:

- ☐ Application design and implementation (front-end).
- ☐ **Database design and implementation (back-end)**.
- ☐ Administrative and organizational procedures.

Information Systems

- ❑ **System analysis** is the process that establishes the need for and the extents/scope of an information system.
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- ❑ The process of creating an information system is known as **systems development**.
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- ❑ **Database design** takes place within the context and limits of an information systems development process.

Evolution of Software Development Process Models

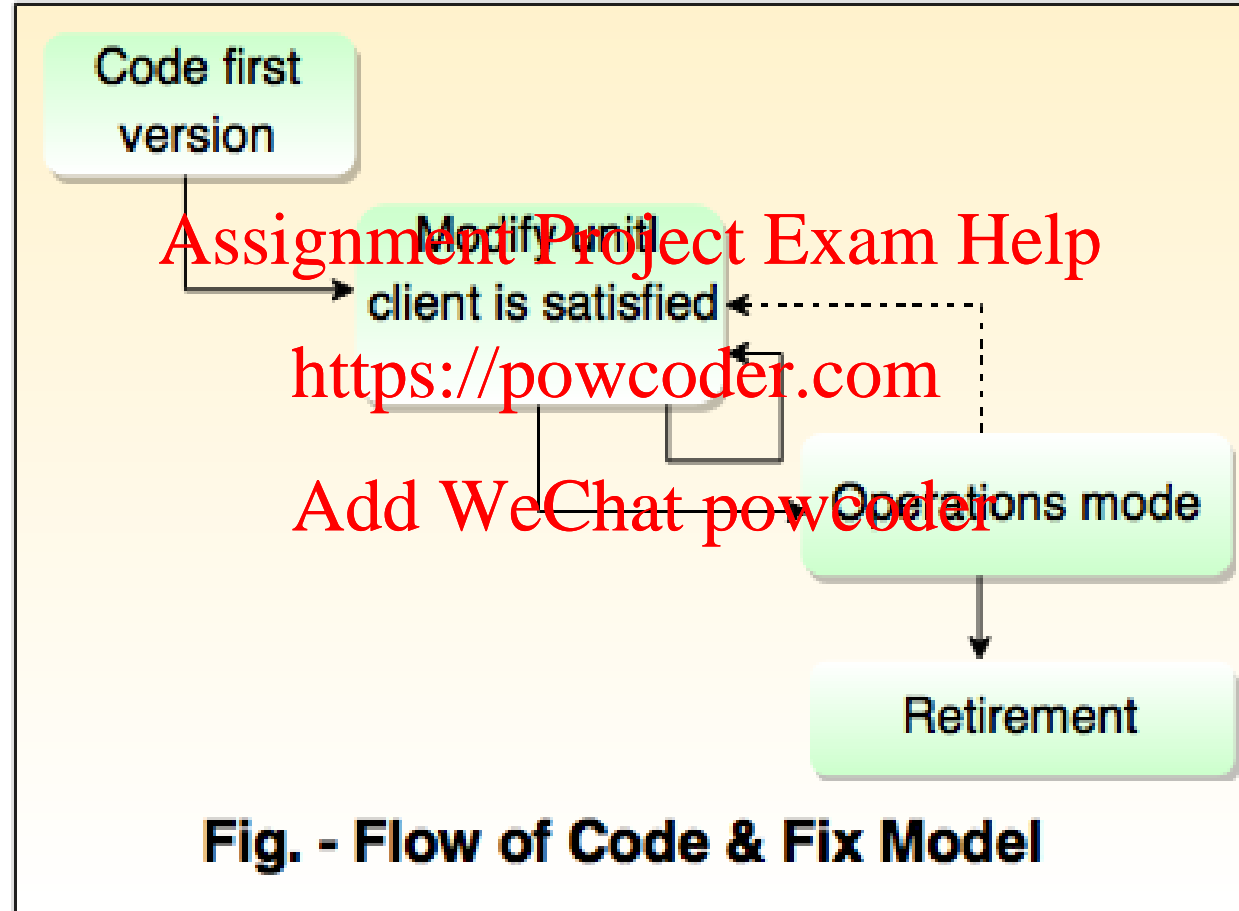


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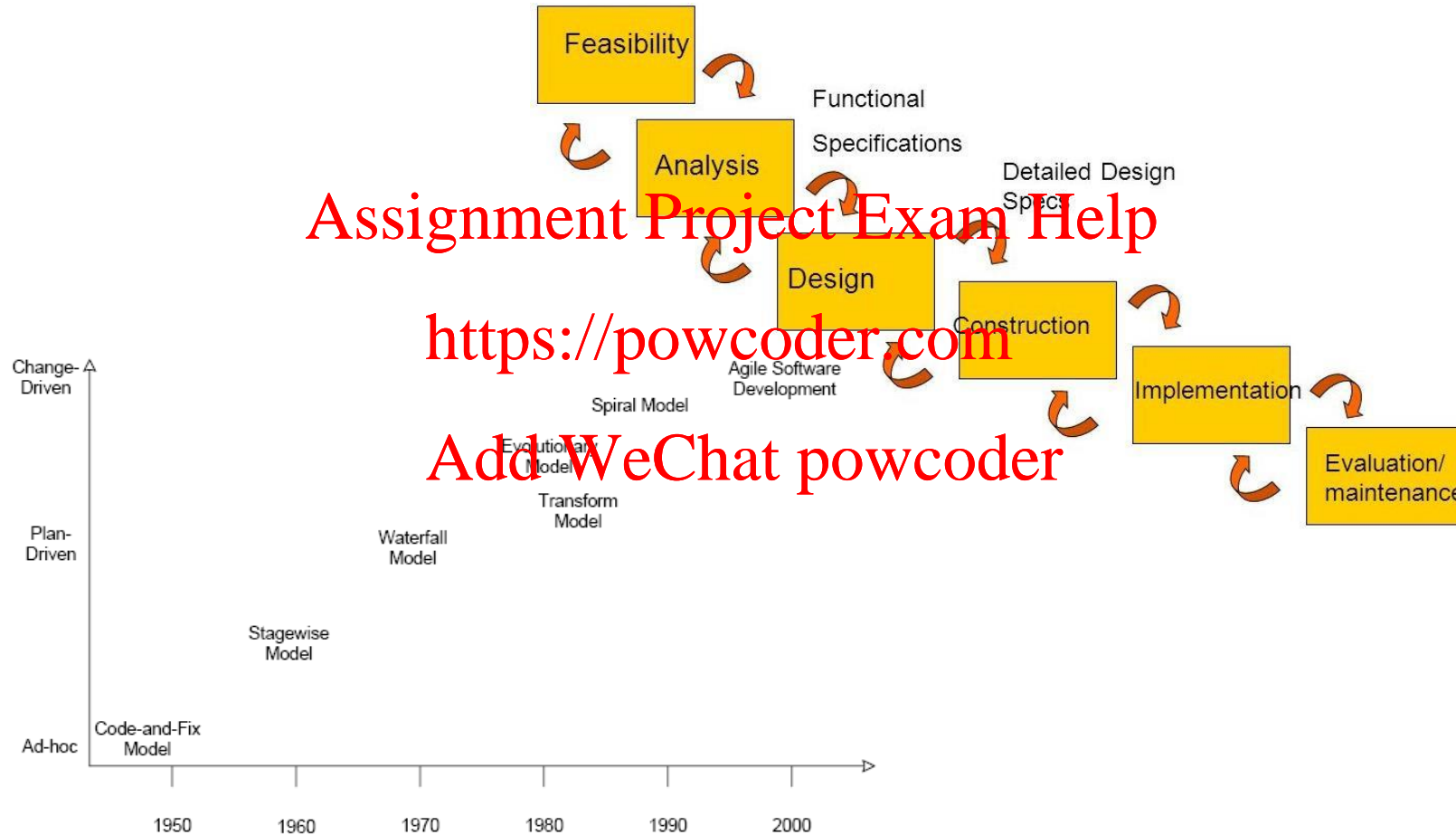
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Code & Fix Model



Source: tutorialride.com

Stagewise/Waterfall Model



Scrum/Agile Development Model



Scrum/Agile Development Model

SCRUM PROCESS

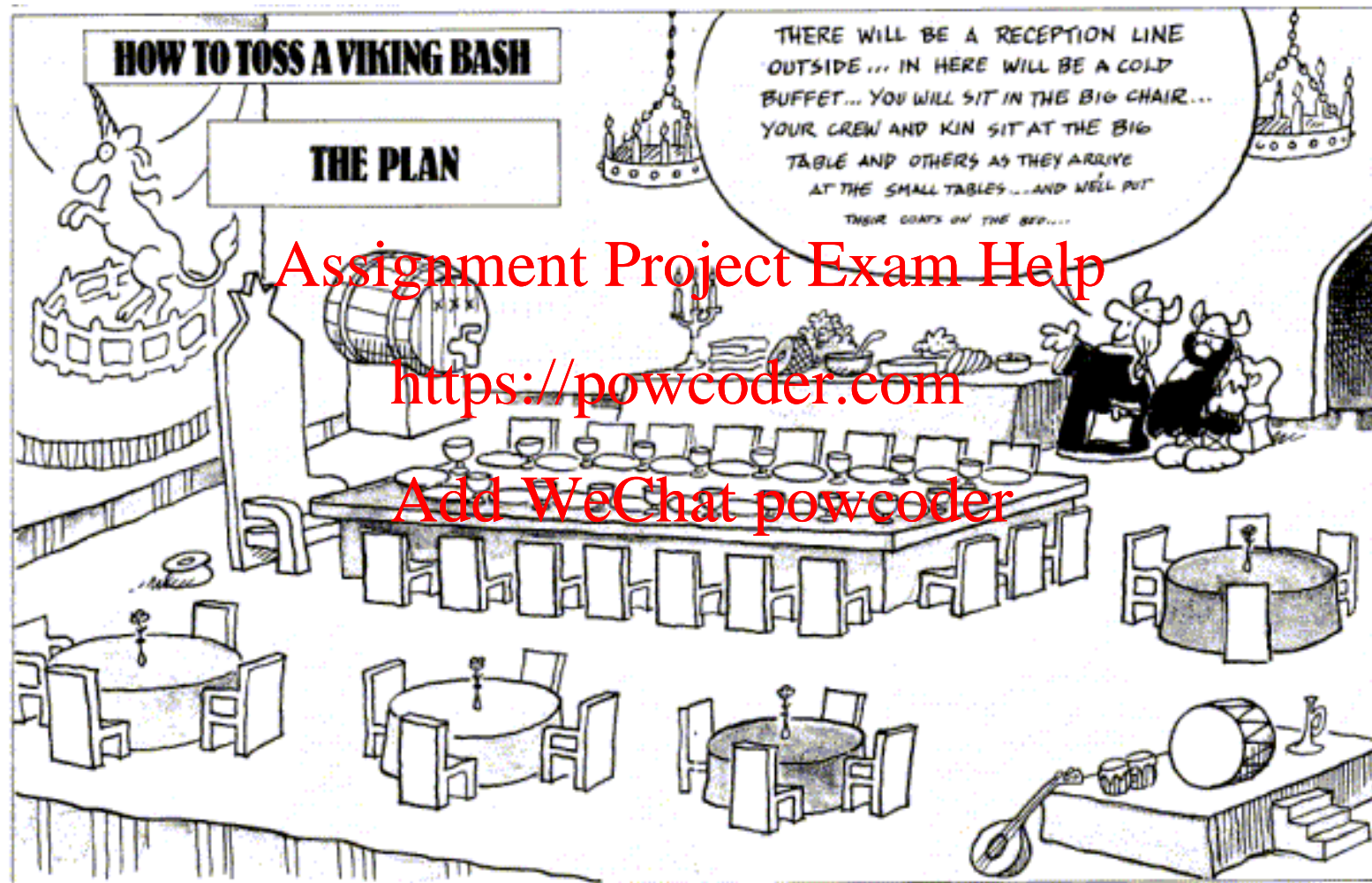


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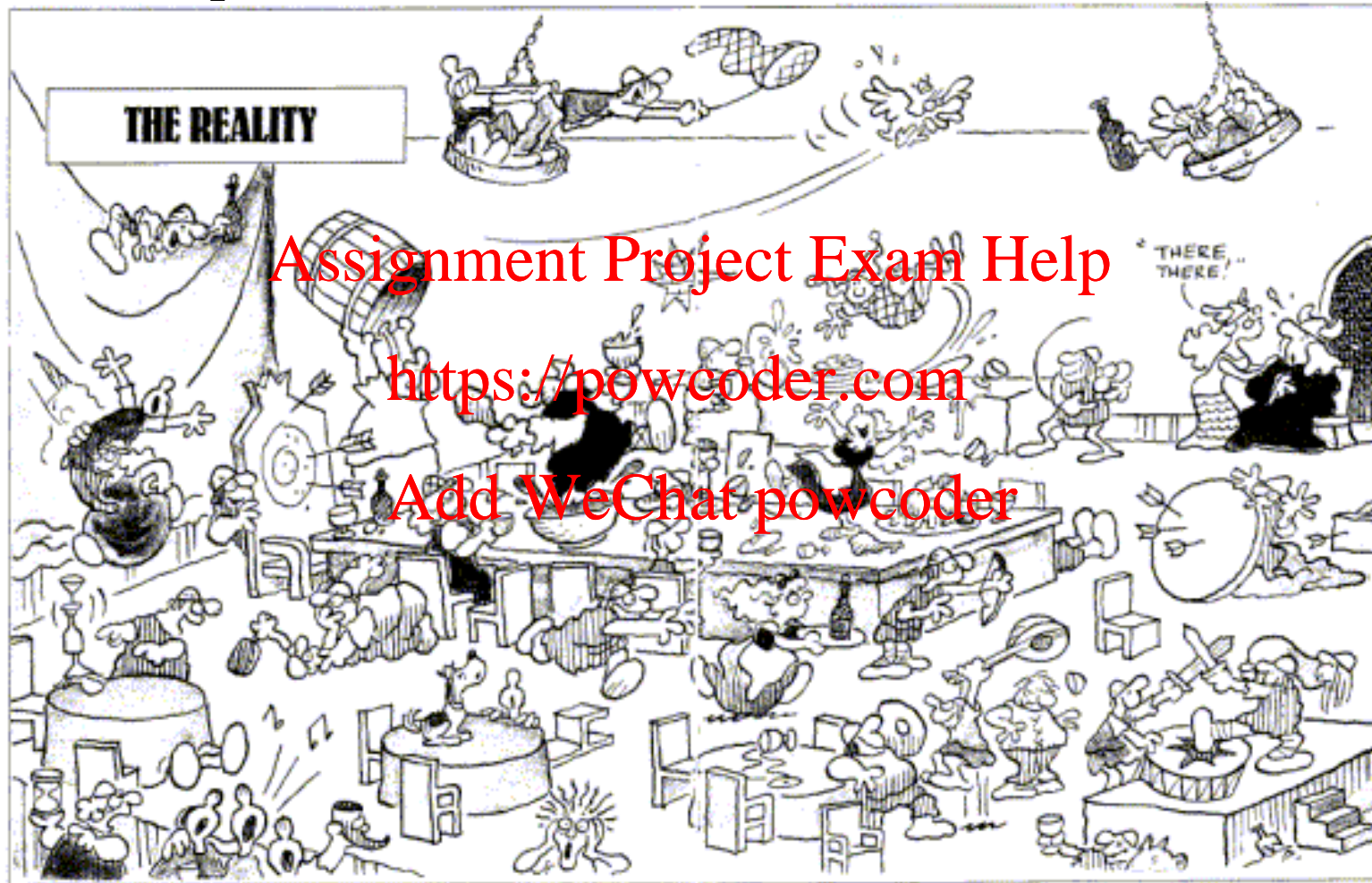
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The Plan



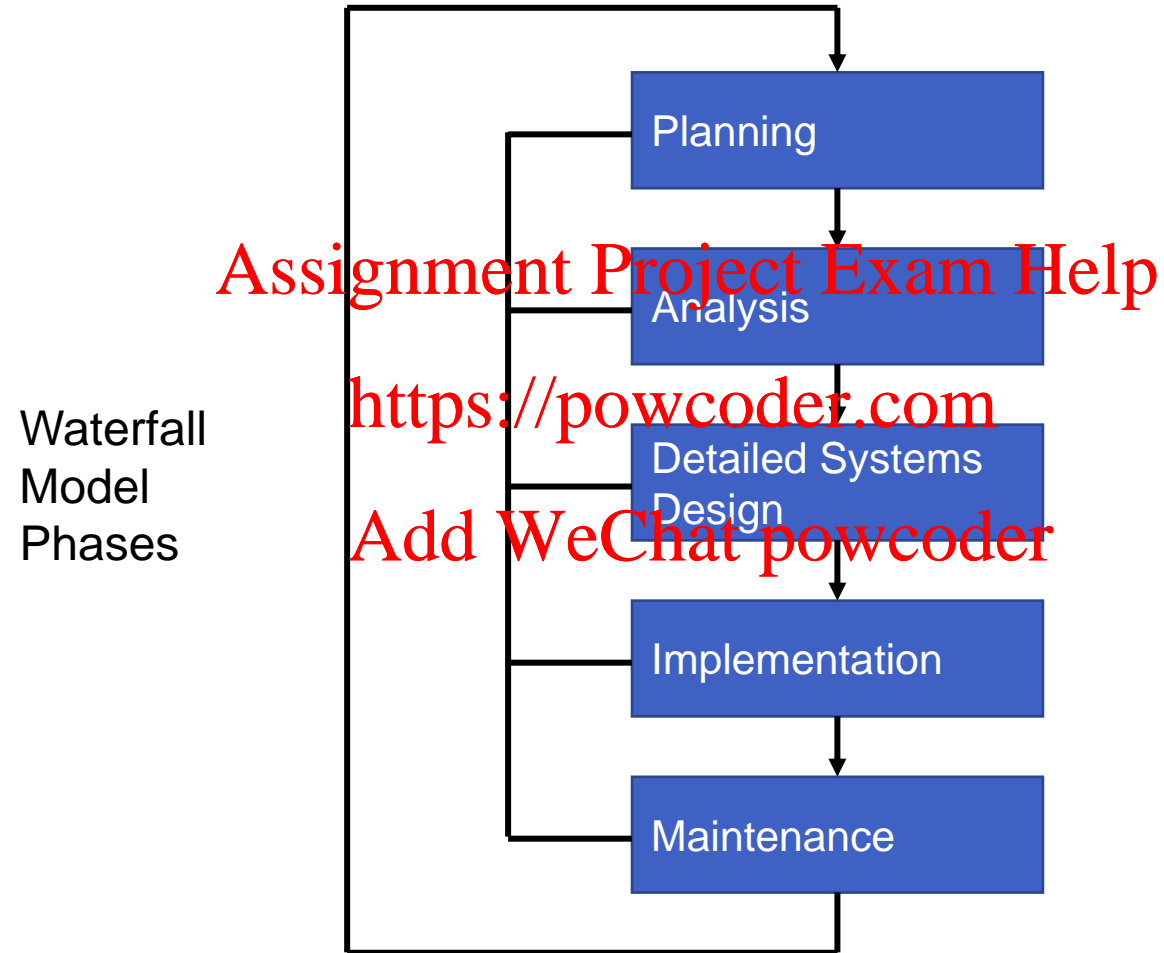
The Reality



The Result



Software Development Lifecycle (SDLC)



SDLC

Planning

- ☐ General overview of the company and objectives
- ☐ Initial assessment
- ☐ Feasibility of a new system (e.g. benefits/cost)

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Analysis

- ☐ User requirements
- ☐ Existing system evaluation (How do these requirements fit into overall system?)
- ☐ Logical system design

SDLC

Detailed System Design

- ☐ Completion of design which includes screens, menus, reports, etc.

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Implementation

- ☐ Cycle of coding, testing & debugging
- ☐ Installation, fine-tuning

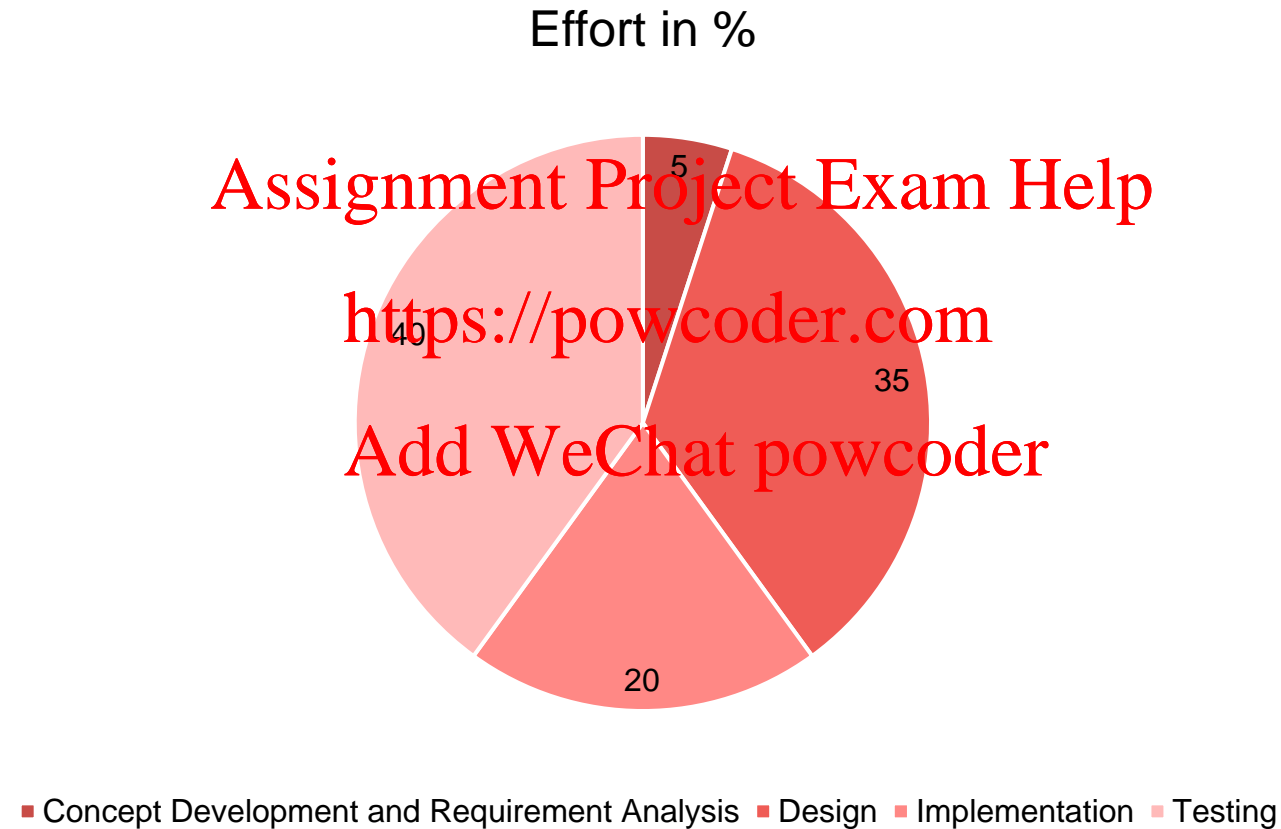
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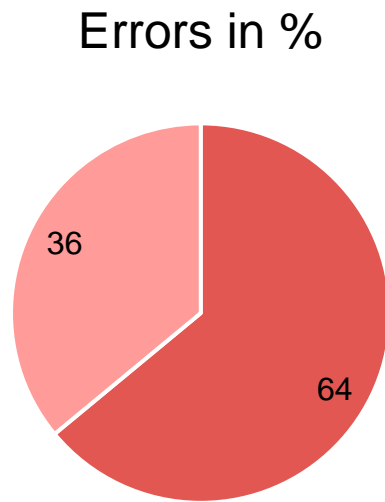
Maintenance

- ☐ Evaluation
- ☐ Maintenance
- ☐ (Minor) Enhancement

Distribution of Effort for Product: Initial Development



Typical Errors in a Product

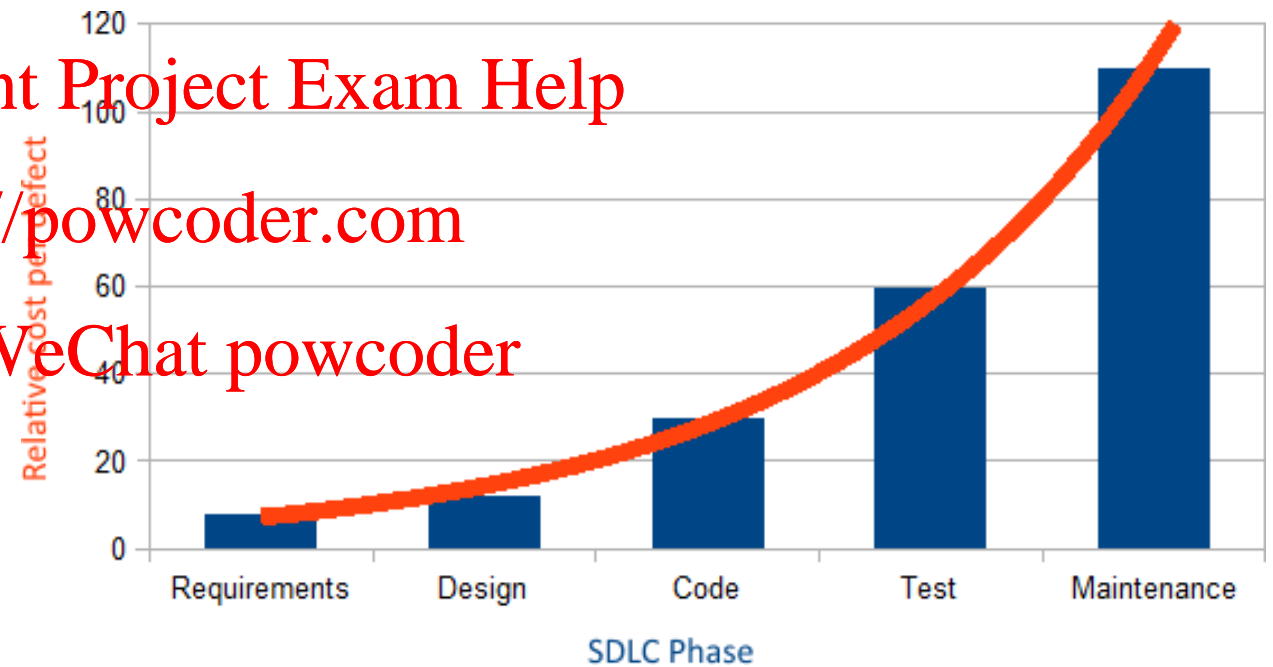


- Requirements Specification and Design Errors
- Implementation Errors

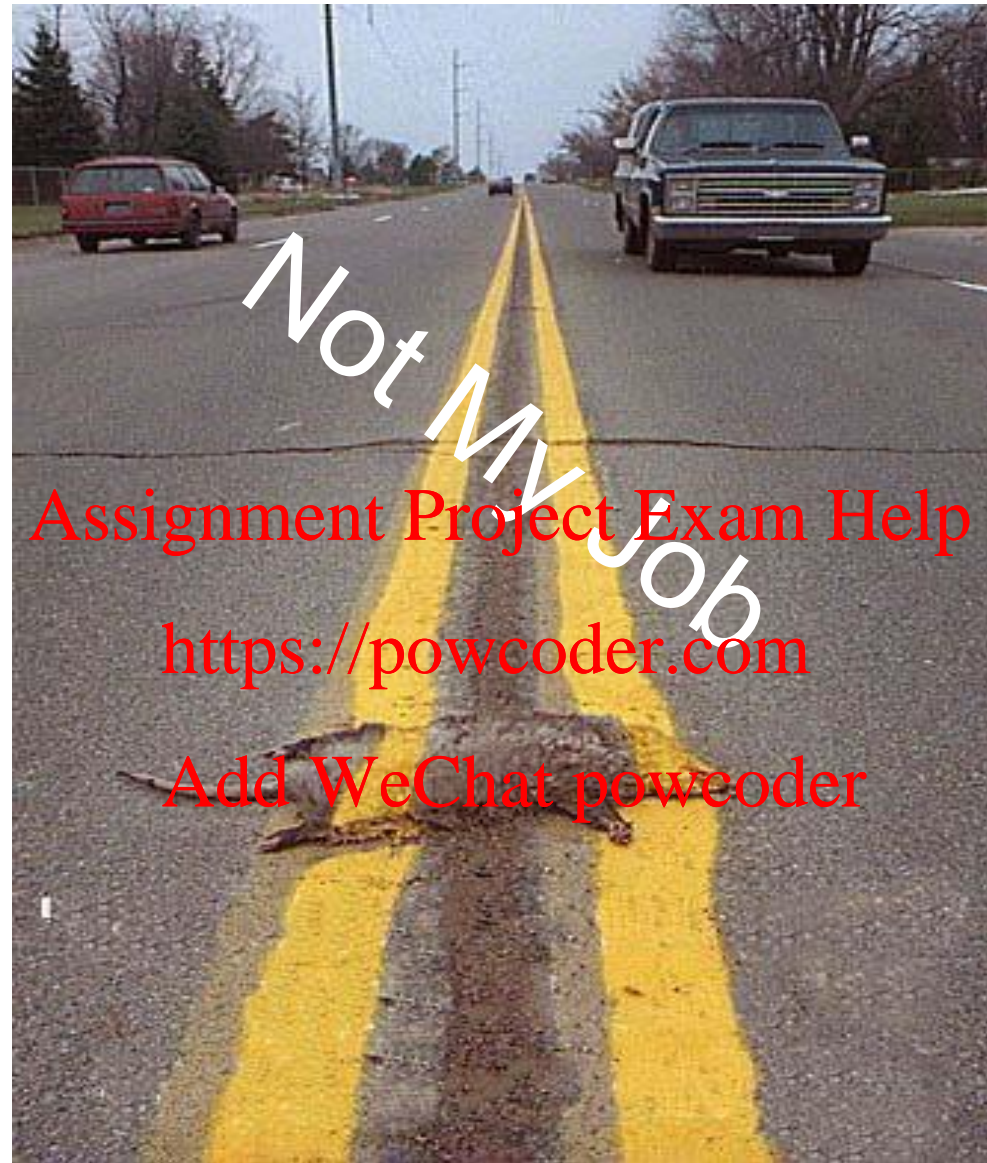
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Much better to discover the error in its early stage(s)!



Database Lifecycle (DBLC)

- ❑ Also called Database Development Lifecycle (DDLC)

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- ❑ Part of/subset of/embedded in the systems/software development lifecycle (SDLC)

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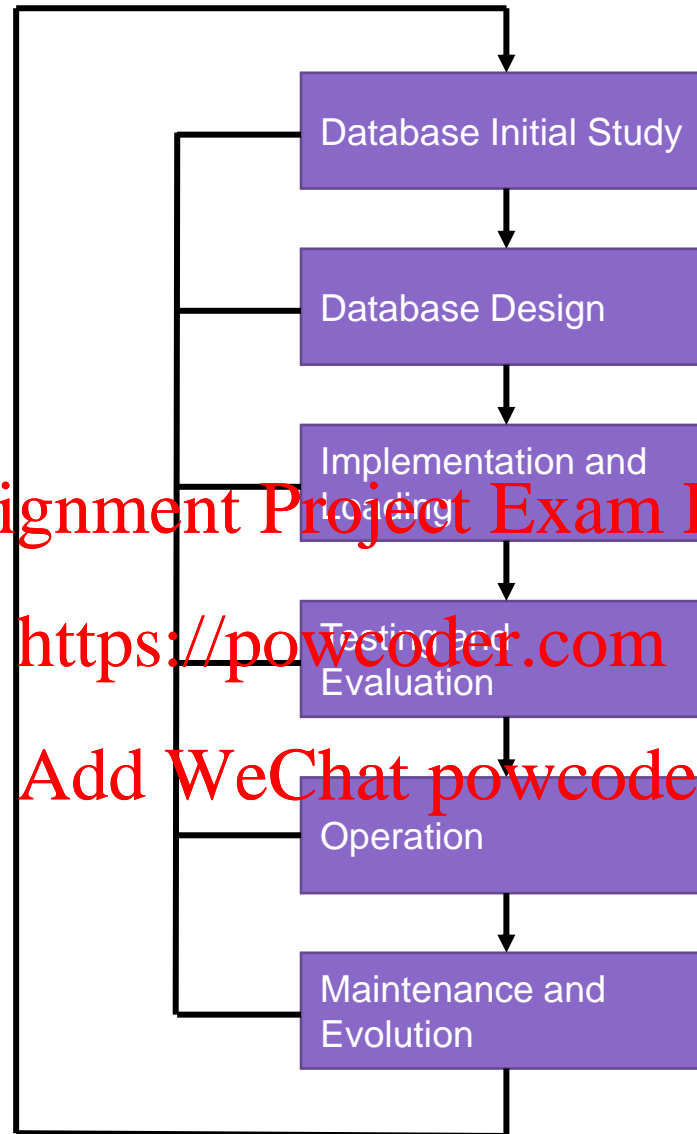
- ❑ Six phases (see next slide)

Database
Lifecycle

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DBLC Phase 1: Database Initial Study

Analyzing the organization

- ☐ Objectives, Operations & Structures

Defining problems and constraints

- ☐ Function of existing systems
- ☐ Input of existing systems
- ☐ Output of existing systems

Defining objectives

- ☐ Initial objectives
- ☐ Data sharing and interfaces with other systems

Define scope and boundaries

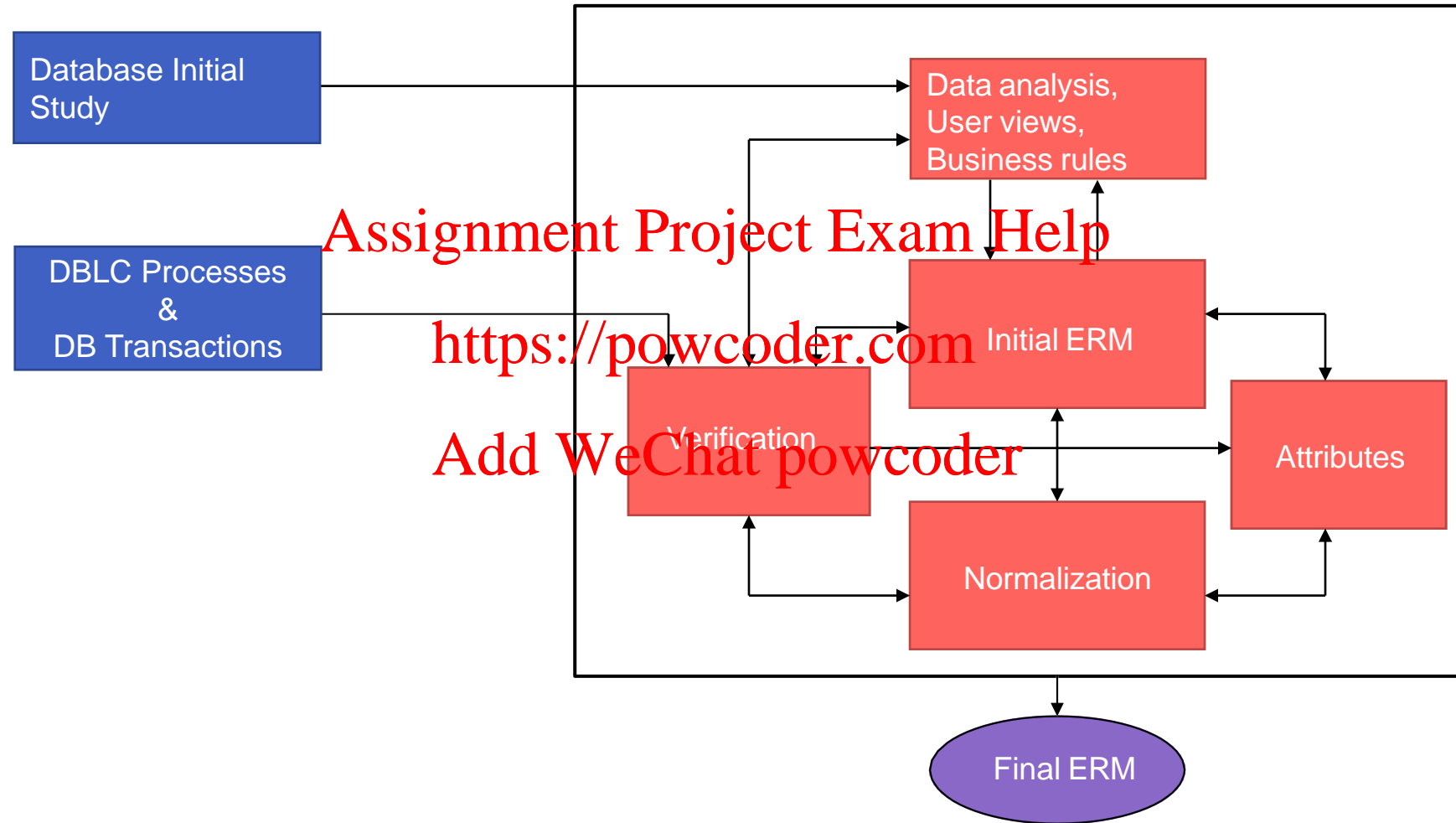
- ☐ DB design for which part of the organization?
- ☐ What hardware will be used?

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Iterative ER Modelling Process



DBLC Phase 2: Database Design

Conceptual Design

- ☐ **Data analysis and data requirements**
 - a. What are the end-user views needed?
 - b. What are the inputs and outputs needed?
 - c. What are information is needed and where does it come from?
- ☐ **ER modelling and normalization**
 - a. What are the business rules?
 - b. What are the entities, attributes and relationships for ER diagram?
 - c. What are the keys?
 - d. Do we need to normalize?
- ☐ **Model verification**

DBLC Phase 2: Database Design

Logical Design

- ☐ Translating/mapping the conceptual design into internal model of a selected **DBMS** (e.g., Oracle, Access, MySQL, etc.).

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Physical Design

- ☐ Defining data access characteristics of the database (e.g., indexes).
- ☐ Optimizing performance (e.g., choice of storage medium).

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Resources for Implementation

- ☐ DBMS
- ☐ Hardware

Note: Logical and physical design can be carried out in parallel activities, but requires high level of understanding of software and hardware.

DBLC Phase 3: Implementation and Loading

Core tasks:

- ☐ Creating DB
- ☐ Assigning permission to a Database Administrator (DBA)
- ☐ Creating tables within DB
- ☐ Assigning permission to users

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Further areas needing attention:

- ☐ Performance (hardware, software, indexes, buffer size, etc.)
- ☐ Security (physical security, password security, access rights, audit trails, data encryption, diskless workstations)
- ☐ Backup and Recovery
- ☐ Data Integrity Company Standards
- ☐ Concurrency Control (allowing simultaneous access to a DB while preserving data integrity)

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Database Security and Data Privacy

Database security is to ensure that **only authorized users can perform authorized activities at authorized time.**

- ❑ Authentication → user has the basic right to use the system.
- ❑ Authorization → user has the right to do specific activities on the system.

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Data privacy (or information privacy) is the relationship between collection and dissemination of data, technology, the public expectation of privacy and the legal and political issues surrounding them. Privacy concerns exists wherever **personally identifiable information (PII)** is stored. There are several wide range of sources where data privacy issues can arise, for example:

- ❑ Healthcare records
- ❑ Financial institutions and transactions
- ❑ Criminal justice investigations

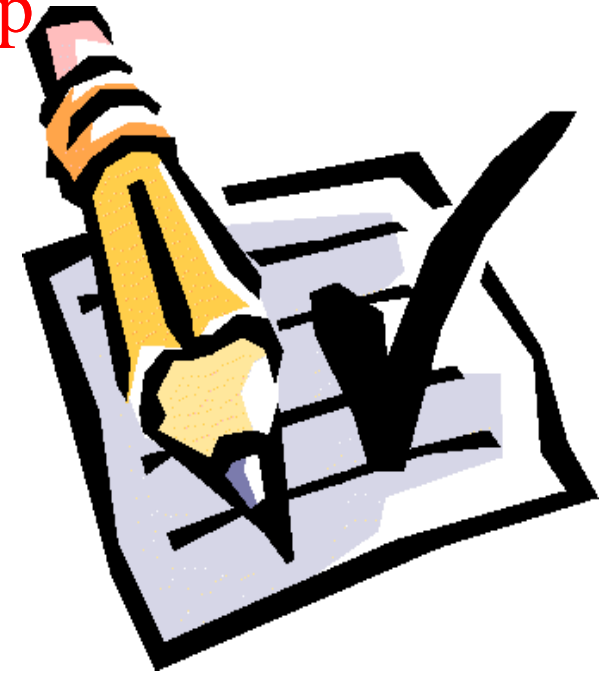
DBLC Phase 4: Testing and Evaluation

- ❑ Testing **performance** / performance fine-tuning
- ❑ Testing **security constraints**
- ❑ Testing **integrity**
- ❑ Testing **concurrent access**

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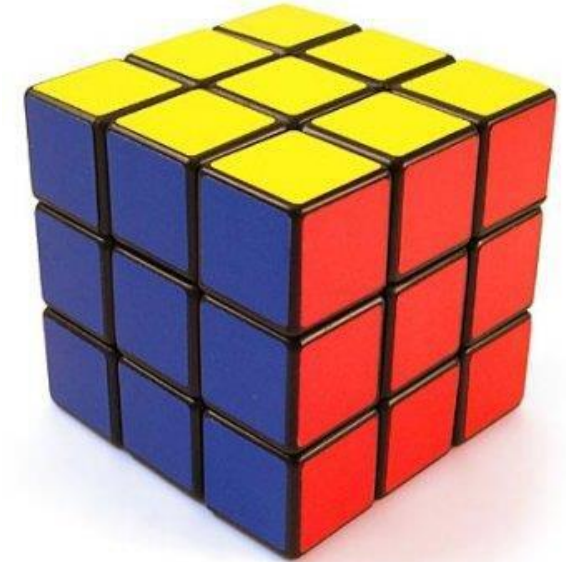
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DBLC Phase 5: Operation

- ❑ DB (and application) completed
- ❑ “Going into production/operation”
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- ❑ Running information system
- ❑ Users and applications start to insert, receive, update and delete data...
- ❑ DBA starts to (ongoing) fine-tune performance, allocate storage space, control access, backup data...



DBLC Phase 6: Maintenance and Evaluation

DBA has responsibility for **routine maintenance** activities within the DB:

- ☐ **Preventive** maintenance (backup)
- ☐ **Corrective** maintenance (recovery)
- ☐ **Adaptive** maintenance (enhancing performance, adding entities, adding attributes, etc.)
- ☐ Access control, statistics, auditing, periodic system-usage summaries, etc.



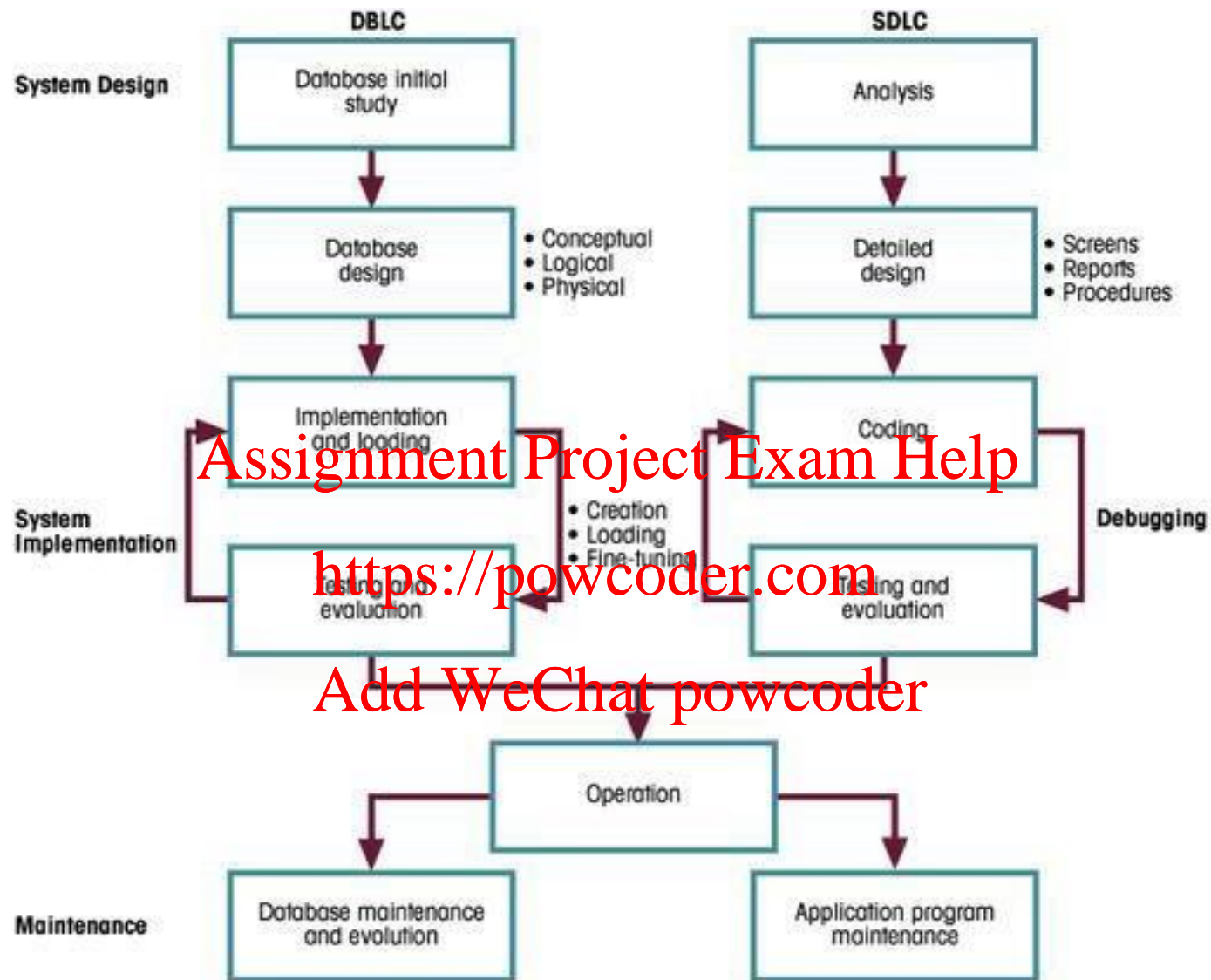


FIGURE 6.13 PARALLEL ACTIVITIES IN THE DBLC AND THE SDLC

DBMS and Organisational Change

DBMS is a **software package** with computer programs that control the creation, maintenance and use of databases (e.g., Oracle).

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The introduction of a DBMS to an organization may **affect the organization** in various ways.

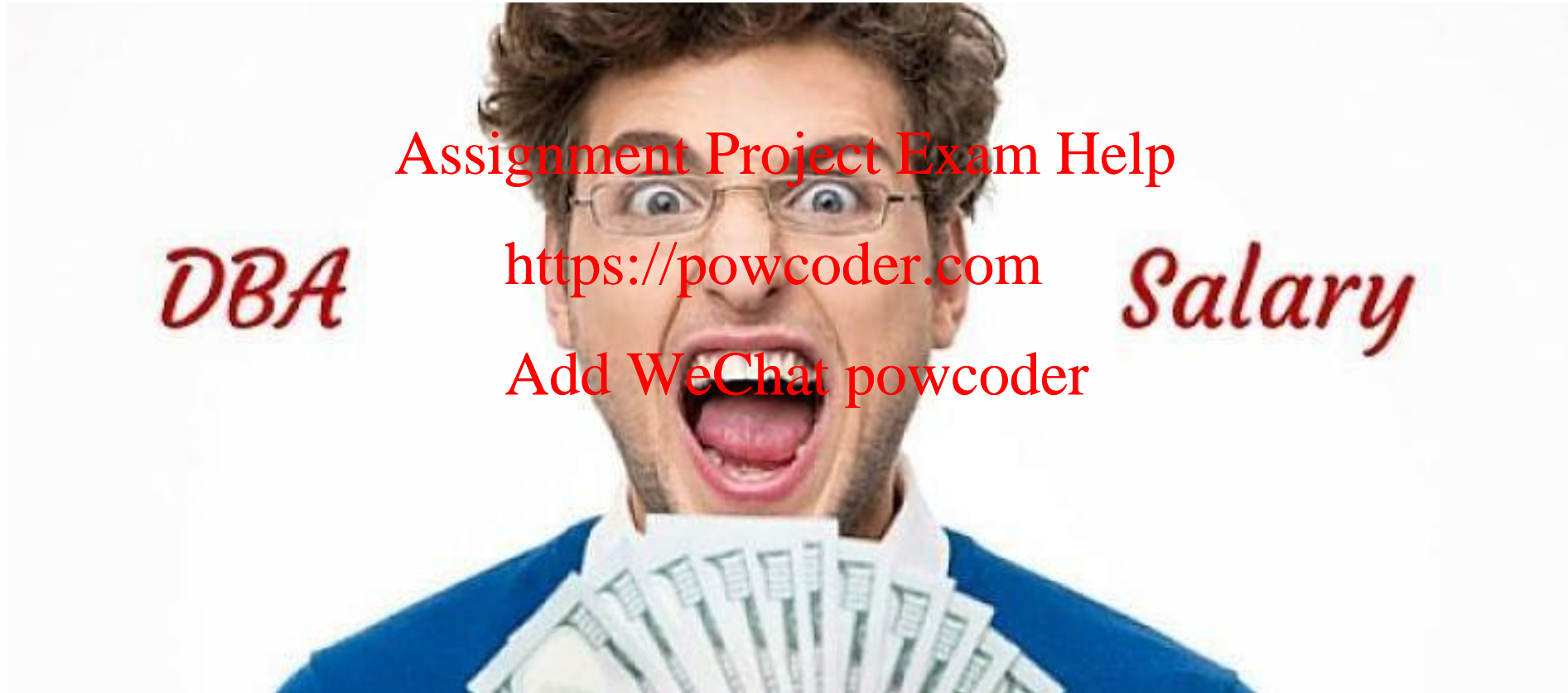
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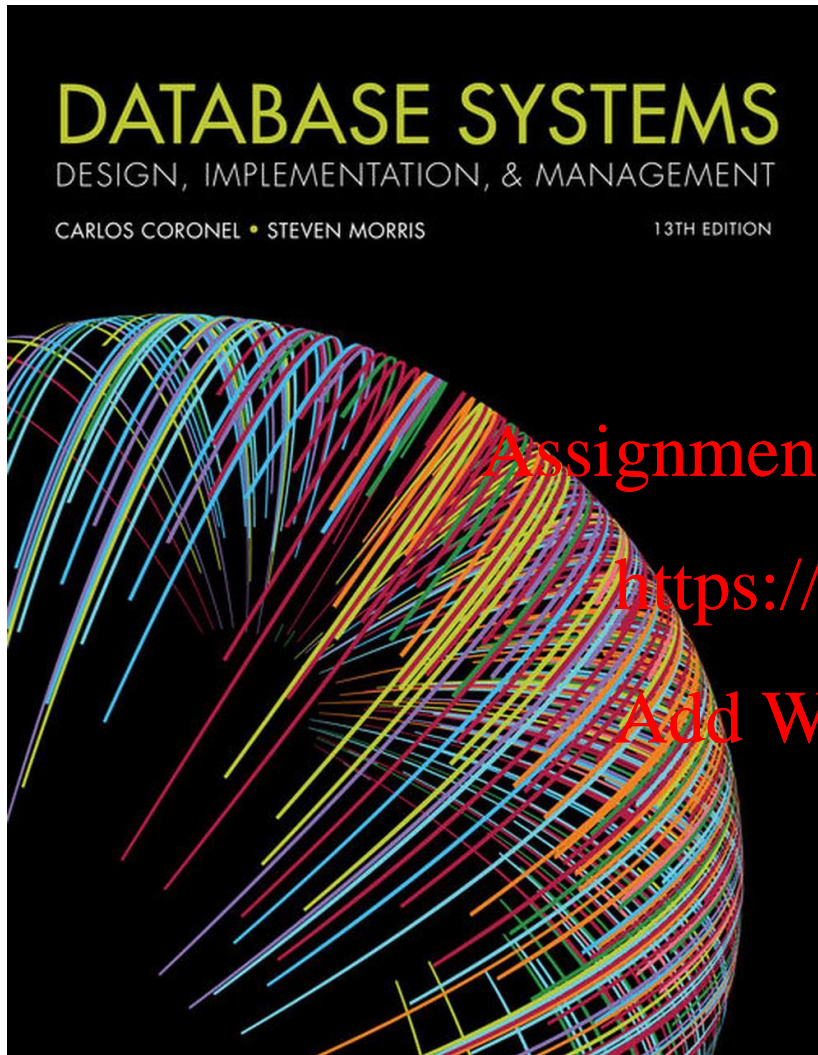
When a new DBMS is introduced to an organization, three important aspects have to be addressed.

- ☐ **Technological:** DBMS hardware and software
- ☐ **Managerial:** Administrative functions
- ☐ **Cultural:** Corporate resistance to change

Database Administrator (DBA)



Source: dbadave.co.uk



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Chapter 16

Database Administration and Security

16-1 to 16-5

Database Administrator (DBA)

Database Administrator (DBA): A **technical function** that is responsible for physical database design and for dealing with technical issues such as security enforcement, database performance, backup and recovery.

Data Administrator (DA): A high-level function that is responsible for the **overall management** of data resources in an organization, including maintaining corporate-wide definitions and standards. The DA is responsible for controlling the overall company data resource.

The DA's job description covers a larger area of operations than the DBA's.
(DA → Data Governance Lead/Manager)

TABLE 15.1 ■ CONTRASTING DA AND DBA ACTIVITIES AND CHARACTERISTICS

DATA ADMINISTRATOR (DA)	DATABASE ADMINISTRATOR (DBA)
Strategic planning	Control and supervision
Sets long-term goals	Executes plans to reach goals
Sets policies and standards	Enforces policies and procedures Enforces programming standards
Broad scope	Narrow scope
Long term	Short term (focus on daily operations)
Managerial orientation	Technical orientation
DBMS-independent	DBMS-specific

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DBA

- ❑ The DBA is responsible for the **control of databases**.
- ❑ The **role of DBA varies** between companies.
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- ❑ The **location of the DBA varies** (is up to the company management).
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- ❑ Larger corporations make a distinction between **DBA vs. DA**.

DBA Tasks/Responsibilities

- ☐ **Installing** and upgrading the **database server**
- ☐ **Allocating** system **storage** and planning future storage
- ☐ **Modifying** the database structure
- ☐ **Enrolling users** and maintaining system security
- ☐ **Ensuring compliance** with database vendor license agreement
- ☐ **Controlling** and monitoring **user access**
- ☐ **Monitoring** and optimizing the **performance**
- ☐ **Planning** for **backup** and **recovery**
- ☐ **Maintaining archived data**
- ☐ **Backing up** and **restoring databases**
- ☐ **Contacting database vendor** (e.g., for technical support)
- ☐ **Generating various reports**

Source: Oracle

DBA Ethics

Responsibilities to Company:

- ☐ Follow internal standards and regulations.
- ☐ Inform openly about issues, provide complete information, do not create knowledge silo.
- ☐ Ensure up-to-date security, have recovery plan in place.

Responsibilities to Externals:

- ☐ Follow external regulations.
- ☐ Protect externals from inappropriate data use.
- ☐ Ensure privacy through authorization and security.

Responsibilities to Co-Workers:

- ☐ Be honest and open with co-workers.
- ☐ Protect co-workers from inappropriate data use.
- ☐ Share, teach and help grow the collective knowledge base

Responsibilities to One's Self:

- ☐ Stay up to date on industry and technology.
- ☐ Stay up to date on regulations.
- ☐ Learn new techniques, new tools and best practices.

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Source: DBA Code of Ethics

TABLE 15.2 ■ DESIRED DBA SKILLS

MANAGERIAL	TECHNICAL
Broad business understanding	Broad data-processing background
Coordination skills	Systems Development Life Cycle knowledge
Analytical skills	Structured methodologies: Data flow diagrams Structure charts Programming languages
Conflict resolution skills	Database Life Cycle knowledge
Communications skills (oral and written)	Database modeling and design skills Conceptual Logical Physical
Negotiation skills	Operational skills: database implementation, data dictionary management, security, etc.
Experience: 2–5 years in a large DP department	

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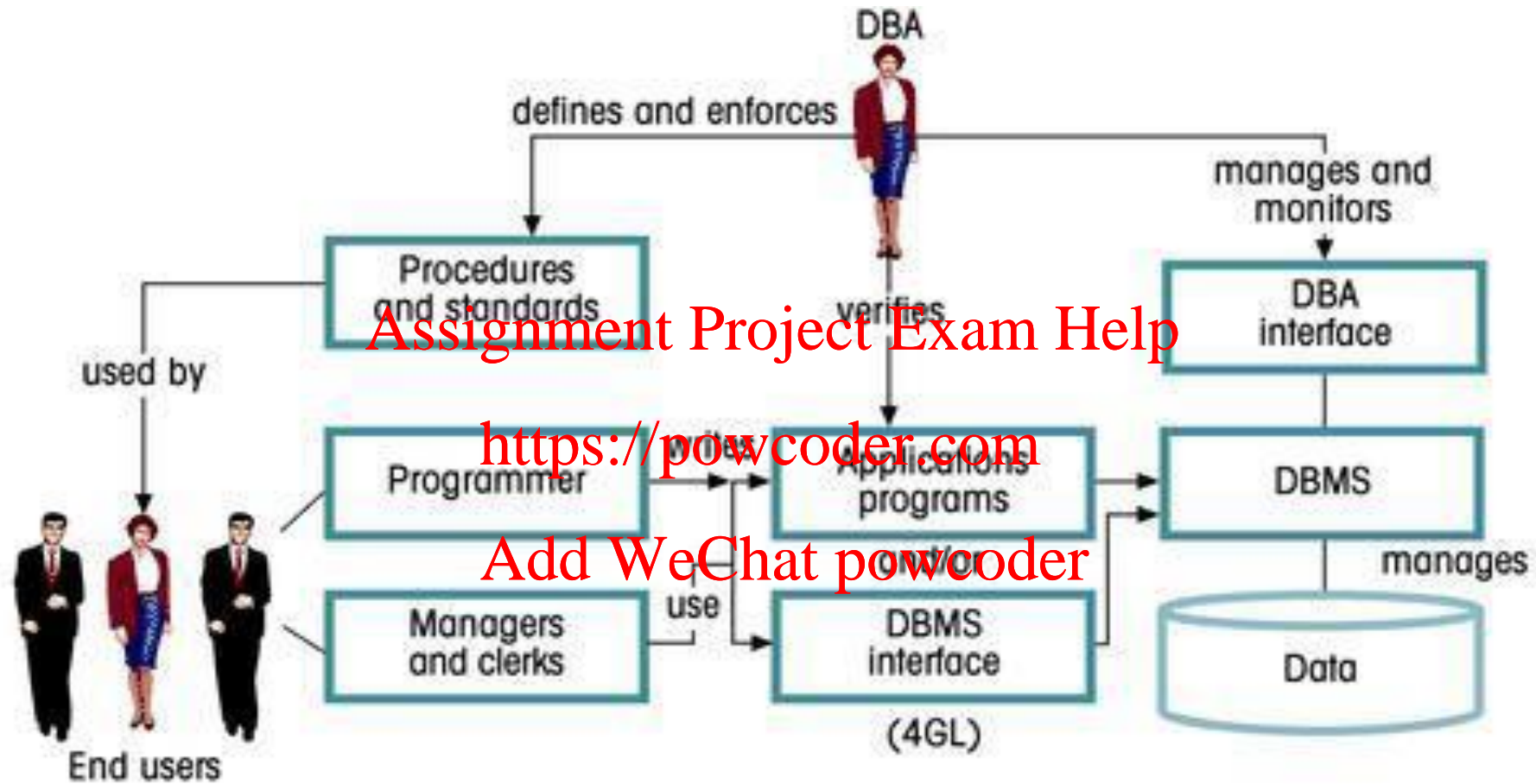


FIGURE 15.6 A SUMMARY OF DBA ACTIVITIES

Questions



Source: petcare.com.au