Chapter 4

Information System and Systems Analysis and Design

Learning Objectives

- Explain the parts of an information system: people, procedures, software, hardware, data, and the Internet
- Explain the functional view of an organization and describe each function
- Describe the management levels and the informational needs for each level in an organization
- Discuss how information flows within an organization

Learning Objectives

- Discuss computer-based information systems.
- Distinguish among a transaction processing system, a management information system, a decision support system, and an executive support system.
- Distinguish between office automation systems and knowledge work systems.
- Explain the difference between data workers and knowledge workers.

Part 1: Information System

Introduction

- An information system is a collection of people, procedures, software, hardware, data, and the Internet
  - They all work together to provide information essential to running an organization
  - Computers are used in organizations to keep records of events
- Competent end users need to understand how the information flows as it moves through an organization

People

- It is easy to overlook people as one of the parts of an information system
- Yet this is what personal computers are all about—making **people, and the end users** like you, more productive
- People are involved in information systems in just about every way
  - People ***as a creator*** of information systems
  - people ***who develop*** the information systems
  - people ***as a support*** for information systems
  - people ***who use*** information systems

Procedures

- The rules or guidelines for people to follow when using software, hardware, and data are **procedures.**
- These procedures are typically documented in manuals written by computer specialists.
  - Software and hardware manufacturers provide manuals with their products. These manuals are provided in either printed or electronic form.

Software

- A **program** consists of step-by-step instructions that tell the computer how to do its work.
- The purpose of the software is to convert **data** (unprocessed facts) into **information** (processed facts).
  - For example, a payroll program would instruct the computer to take the number of hours you worked in a week (data) and multiply it by your pay rate (data) to determine how much you are paid for the week (information).

Hardware

- The equipment that processes the data to create information is called **hardware.**
- It includes smartphones, tablets, keyboards, mice, displays, system units, and other devices.
- Hardware is controlled by software.

Data

- The raw, unprocessed facts, including text, numbers, images, and sounds, are called data.
- Processed data yields information, and this Data must
  - Accurate
  - Timely
  - Specific
  - Organized for a purpose,

Internet

- Almost all information systems provide a way to connect to other people and computers, typically using the Internet.
- This **connectivity** greatly expands the capability and usefulness of information systems.

Why are computers used in organizations?

- To keep records of events.
- To help make decisions.

For example:

Point-of-sale terminals record sales as well as which salesperson made each sale. This information can be used for decision-making. For instance, it can help the sales manager decides which salespeople will get year-end bonuses for doing exceptional work.

Organizational Information Flow

- Do not just keep track of transactions and day-to-day business operations.
- Information flows vertically and horizontally throughout an organization
- Information systems support the natural flow of information within an organization's structure
  - 5 Functional Areas
  - Management Levels
  - Information Flow

Five Functions of an Organization

- Accounting
- Marketing
- Human Resources
- Production
- Research

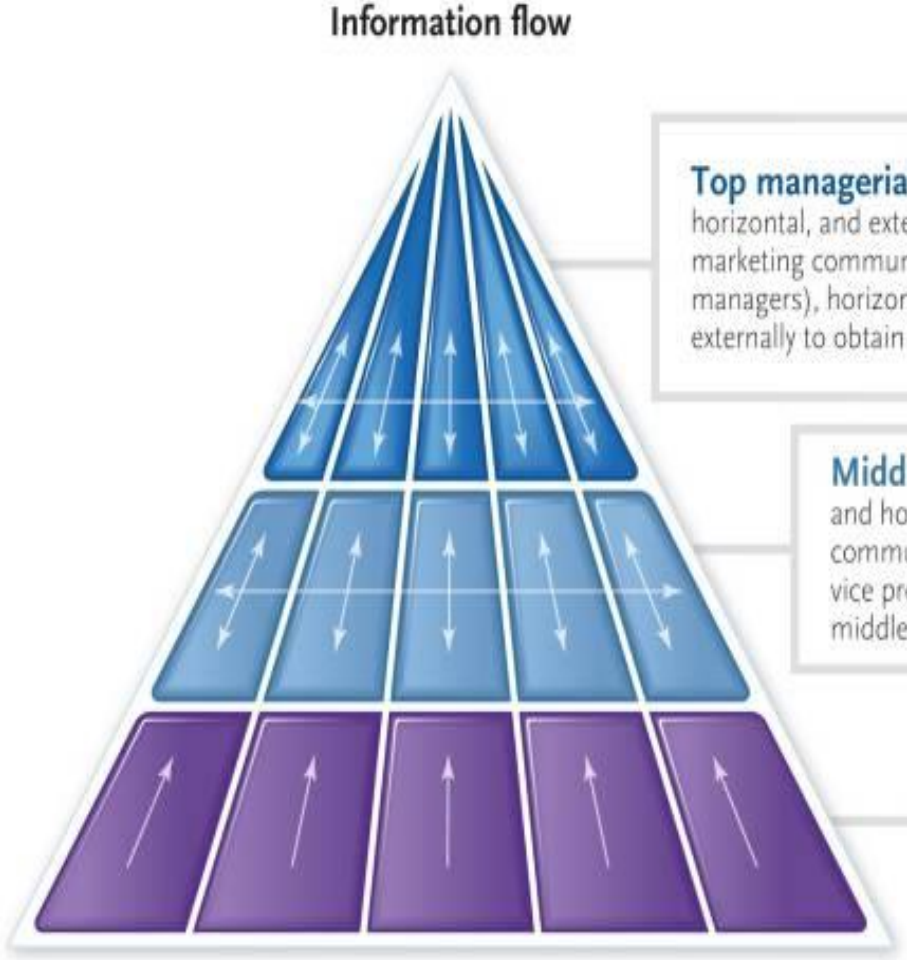
Management Levels

Management is usually divided into three levels: Top, Middle, and Supervisors

Information Flow (Page 1 of 2)

- Each level of management has different information needs
- The information flows to support these needs
  - Top management
    - Vertical, horizontal, and external
  - Middle management
    - Vertical and horizontal
  - Supervisor
    - Primarily vertical

Information Flow (Page 2 of 2)

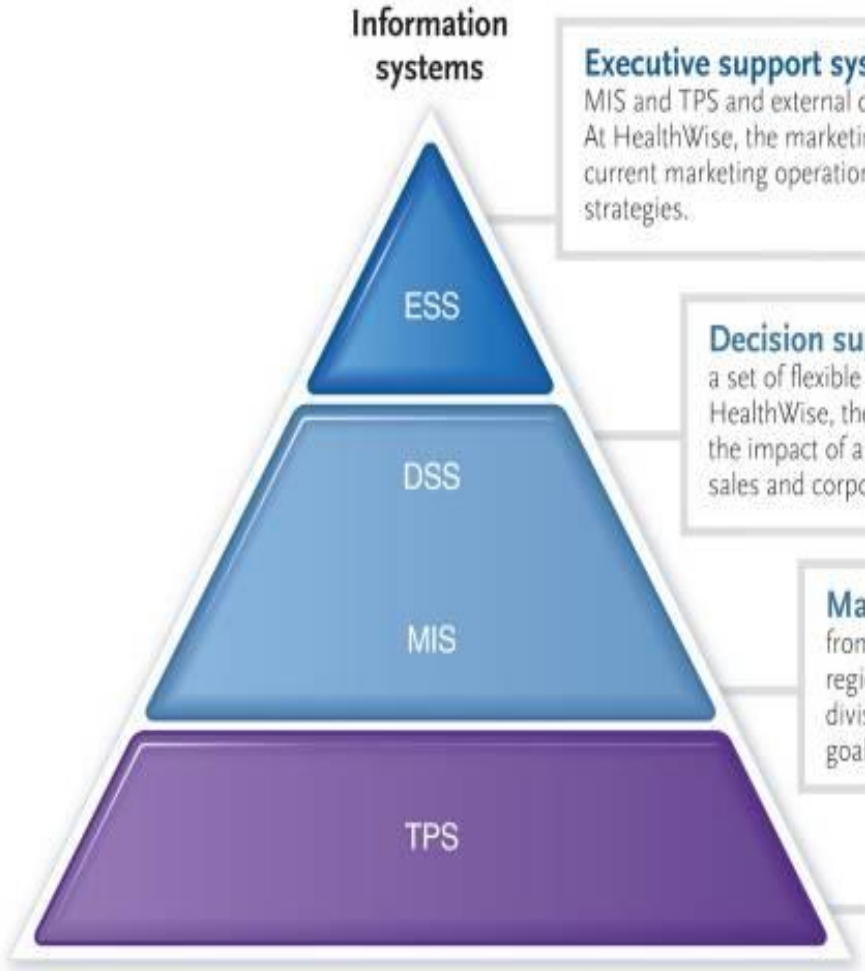


Top managerial-level information flow is vertical, horizontal, and external. At HealthWise, the vice president of marketing communicates vertically (with regional sales managers), horizontally (with other vice presidents), and externally to obtain data to forecast sales.

Middle managerial-level information flow is vertical and horizontal. At HealthWise, regional sales managers communicate vertically (with district sales managers and the vice president of marketing) and horizontally with other middle-level managers.

Supervisory-level information flow is primarily vertical. At HealthWise, production supervisors monitor worker activities to ensure smooth production. They provide daily status reports to middle-level production managers.

Computer-Based Information Systems



Executive support systems (ESS) use internal data from MIS and TPS and external data to support top-level managers. At HealthWise, the marketing vice president uses his ESS to view current marketing operations and to develop long-term marketing strategies.

Decision support systems (DSS) use data from TPS and a set of flexible analytical tools to support middle managers. At HealthWise, the regional sales managers use the DSS to evaluate the impact of a recent national promotion campaign on regional sales and corporate profit.

Management information systems (MIS) use data from the TPS to support middle-level managers. At HealthWise, regional sales managers use their MIS reports to monitor weekly divisional sales and to compare actual sales to established sales goals.

Transaction processing systems (TPS) record day-to-day transactions to support supervisors. At HealthWise, production supervisors use their TPS to record and to monitor current inventory levels and production line output.

Transaction Processing Systems (TPS)

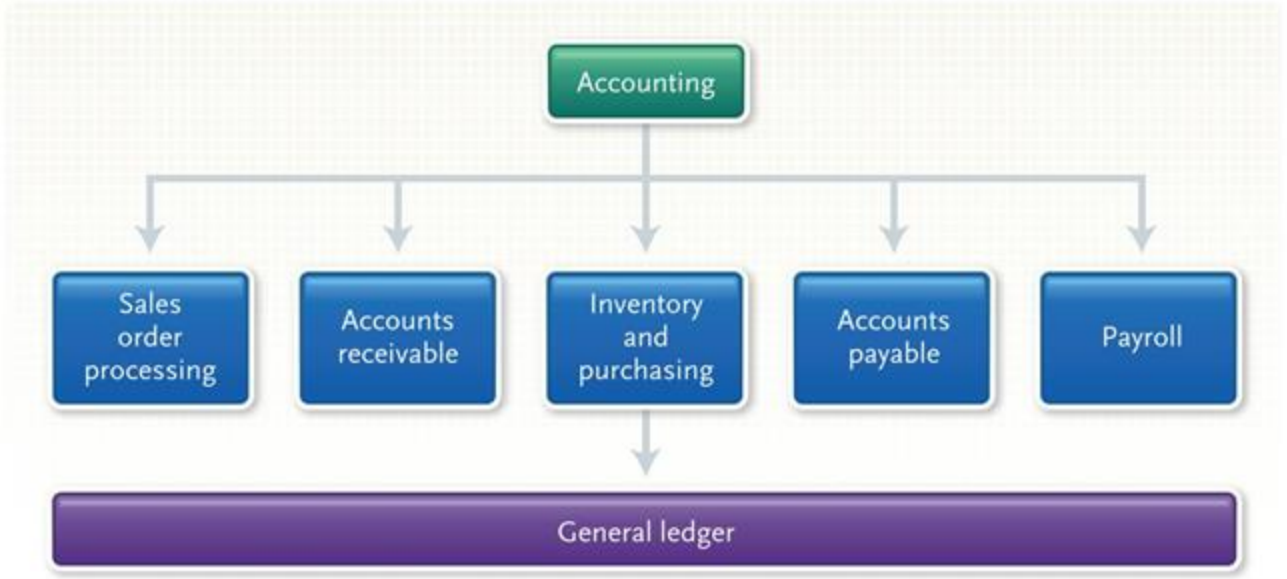
- Records day-to-day transactions in a database
- Also called data processing systems (DPS)
- Transaction processing systems generally go through a five-stage cycle of
  - Data entry activities
  - Transaction processing activities
  - File and database processing
  - Document and report generation
  - Inquiry processing activities.

Examples of TPS systems

- Sales order entry
- Hotel reservation systems
- Payroll
- Employee record keeping
- Automated teller machines
- Credit card authorizations
- Online bill payments
- Self-checkout stations at grocery store
- The trading of stocks over the Internet
- Many other electronic commerce

Example works of TPS for Accounting

- Sales order processing
- Accounts receivable
- Inventory and purchasing



Management Information Systems (MIS)

What is MIS?

- **MIS** is the use of information technology, people, and business processes to record, store and process data to produce information that decision-makers can use to make day-to-day decisions.

Management Information Systems (MIS)

The need for MIS

- MIS provides the information needed for decision-makers to make effective decisions.
- MIS systems provide a smooth way of communication within and outside the organization
- Record keeping – MIS records all an organization's business transactions and provides a reference point.

Management Information Systems (MIS)

- Produces standardized reports to support decision-making by middle managers
- Integrates data and summarizes details from databases in a structured form
- Produces predetermined reports
  - Periodic reports
  - Exception reports
  - Demand reports

HealthWise Group
Regional Sales Report

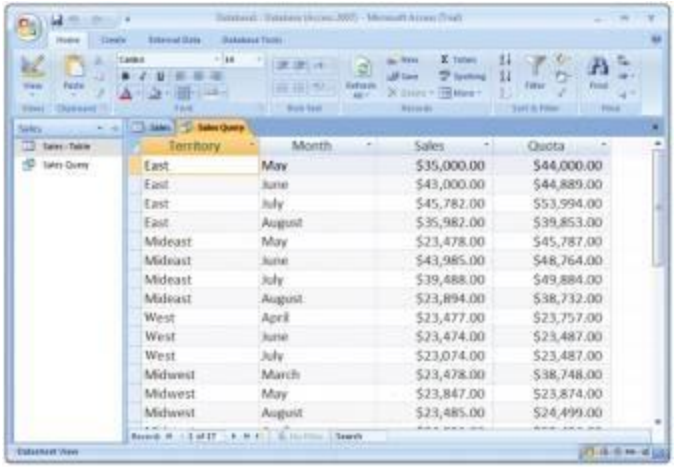
Region	Actual Sales	Target	Difference
Central	$166,430	$175,000	($8,570)
Northern	137,228	130,000	7,228
Southern	137,772	135,000	2,772
Eastern	152,289	155,000	(2,711)
Western	167,017	160,000	7,017

Examples of MIS

- Some other examples of management information systems in an organisation
  - **process control,**
  - **office automation**
  - enterprise resource planning
  - finance systems
  - management reporting
  - and many more …

Decision Support Systems (DSS)

- Flexible tool for analyzing data for decision-making purposes
- Enables managers to get answers to unexpected and generally non-recurring problems
  - Reports do not have a fixed format
- Microsoft Access is often used to provide an easy front-end interface for performing SQL decision support queries



Territory	Month	Sales	Quota
East	May	$35,000.00	$44,000.00
East	June	$43,000.00	$44,889.00
East	July	$45,782.00	$53,994.00
East	August	$35,982.00	$39,853.00
Mideast	May	$23,478.00	$45,787.00
Mideast	June	$43,985.00	$48,764.00
Mideast	July	$39,488.00	$49,884.00
Mideast	August	$23,894.00	$38,732.00
West	April	$23,477.00	$23,757.00
West	June	$23,474.00	$23,487.00
West	July	$23,074.00	$23,487.00
Midwest	March	$23,478.00	$38,748.00
Midwest	May	$23,847.00	$23,874.00
Midwest	August	$23,485.00	$24,499.00

Parts of a DSS

- User
  - A decision-maker, like yourself
- System software
  - Operating system
  - Easy to learn and use
- Data
  - Internal data
  - External data
- Decision models

DSS Decision Models

Strategic models

- Assists top level management in long-range planning

Tactical models

- Assists middle-management control the work
- Financial and sales promotion planning

Operational models

- Assists lower-level managers accomplish the daily activities and objectives

Examples of DSS

- **GPS:** A GPS analyzes route information and traffic data to plan the best path between places.
- **Crop planning:** Decision support systems help farmers know the best time to plant, fertilize and harvest crops.
- **Enterprise resource planning (ERP) dashboards:** Decision-makers use ERP dashboards to oversee performance indicators.
- **Clinical decision-making:** Medical professionals use clinical decision-support systems to help diagnose and plan treatment for patients.

Executive Support Systems (ESS)

- Designed for top management
- Sophisticated software for presenting, summarizing, and analyzing data, but specifically designed to be easy-to-use
- Provides immediate access to a company's key performance indicators

Other Information Systems

- Information workers
  - Data workers
  - Knowledge workers
- Office automation systems (OASs)
  - Supports data workers
  - Project management programs
  - Videoconferencing systems
- Knowledge work systems (KWSs)
  - Use specialized systems, such as CAD/CAM

Enterprise Systems in Organizations

- Business organizations have become very complex and their business needs can no longer be supported by one single information system.
- Information Systems are a critical component of a successful organization today.
- Management is generally categorized into three levels: Strategic, Mid-Management and Operational.
- Information Systems provide a high level of computer automation to support business functions such as:
  - •Accounting
  - •Finance
  - •Human Resource Management
  - •Customer Service
  - •Marketing
  - •Operations

Careers In IT

- Information systems managers oversee the work of programmers, computer specialist, systems analysts, and other computer professionals
- Employers look for individuals with strong technical backgrounds, with a Master's degree
- Strong leadership and communications skills
- Information systems managers can expect to earn from RM 49,200 to RM 73,600 annually

A Look to the Future

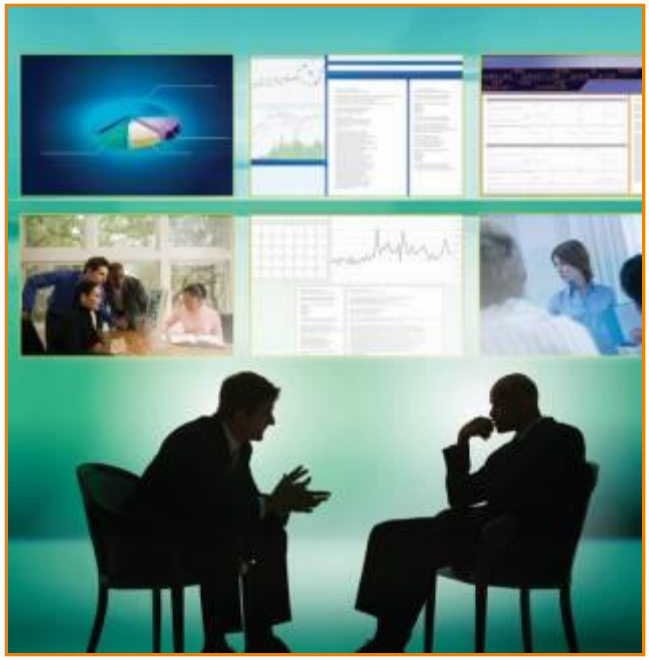
- Information overload
  - May have a negative effect
  - E-mail is one of the major sources of overload

- How to handle e-mail
  - Be selective
  - Remove
  - Protect
  - Be brief
  - Stop spam
  - Don't respond

Part 2: Systems Analysis and Design

Learning Objectives

- Describe the six phases of the systems life cycle.
- Identify information needs and formulate possible solutions.
- Analyze existing information systems and evaluate the feasibility of alternative systems.

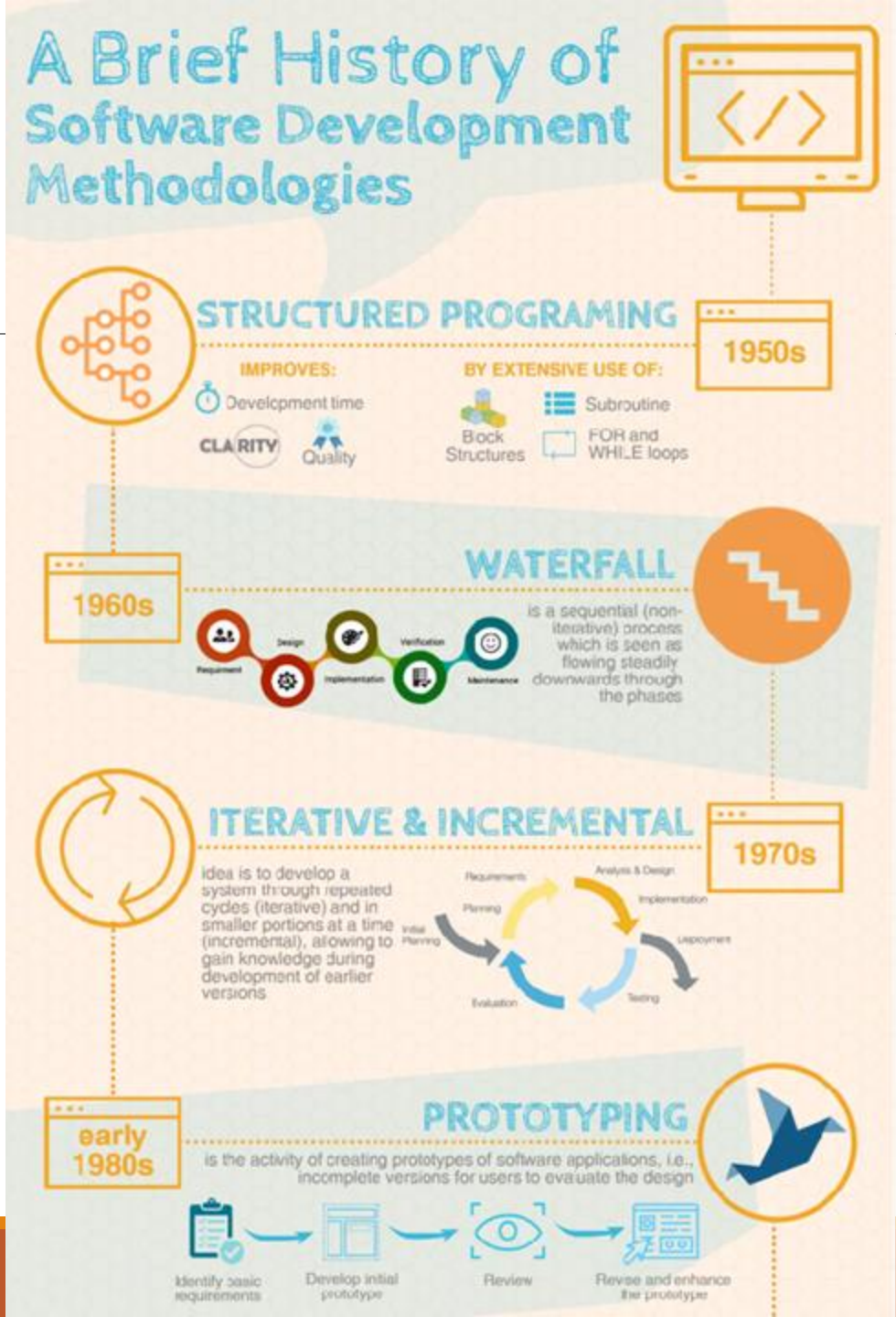


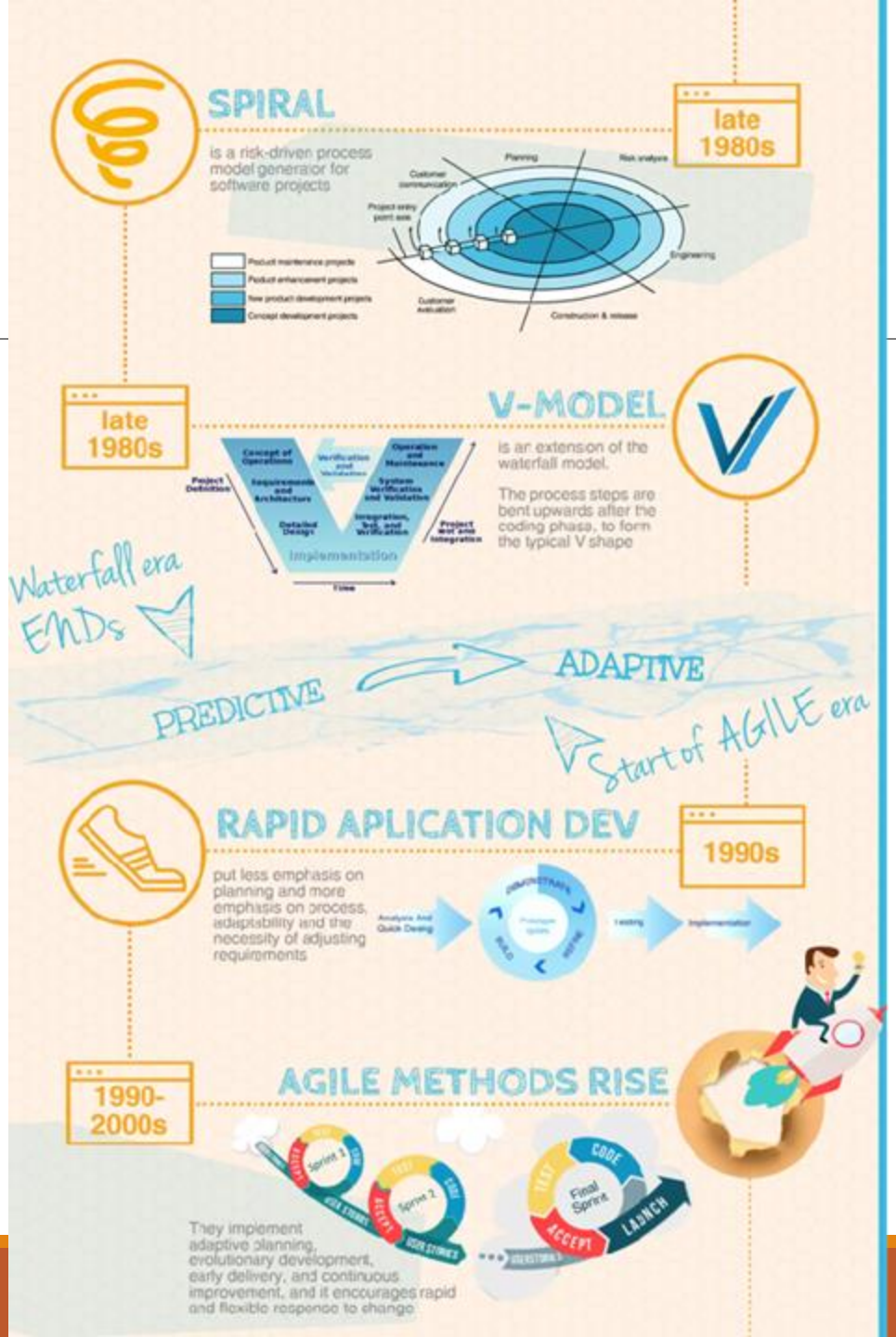
Learning Objectives

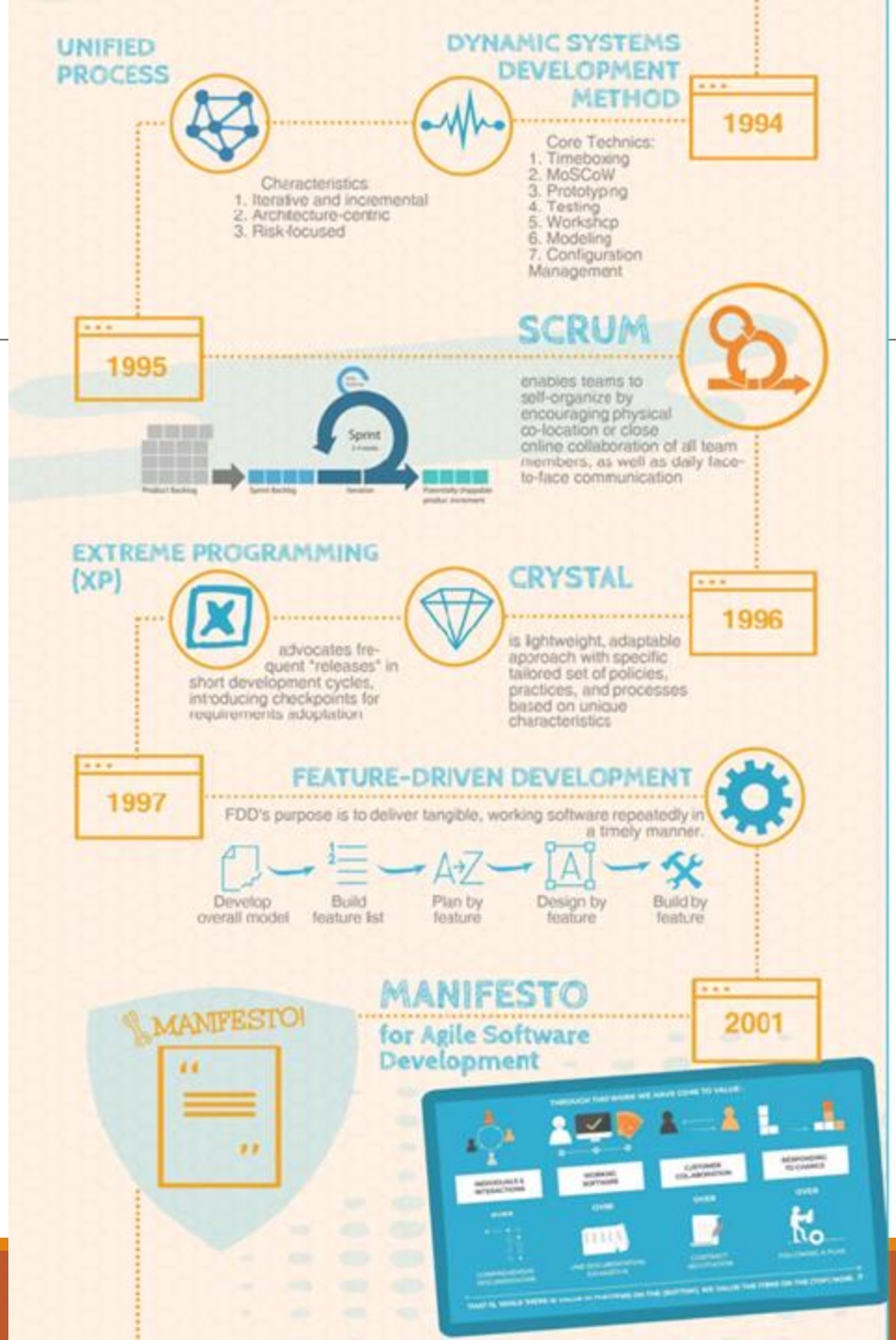
- Identify, acquire, and test new system software and hardware.
- Switch from an existing information system to a new one with minimal risk.
- Perform system audits and periodic evaluations.
- Describe prototyping and rapid applications development.

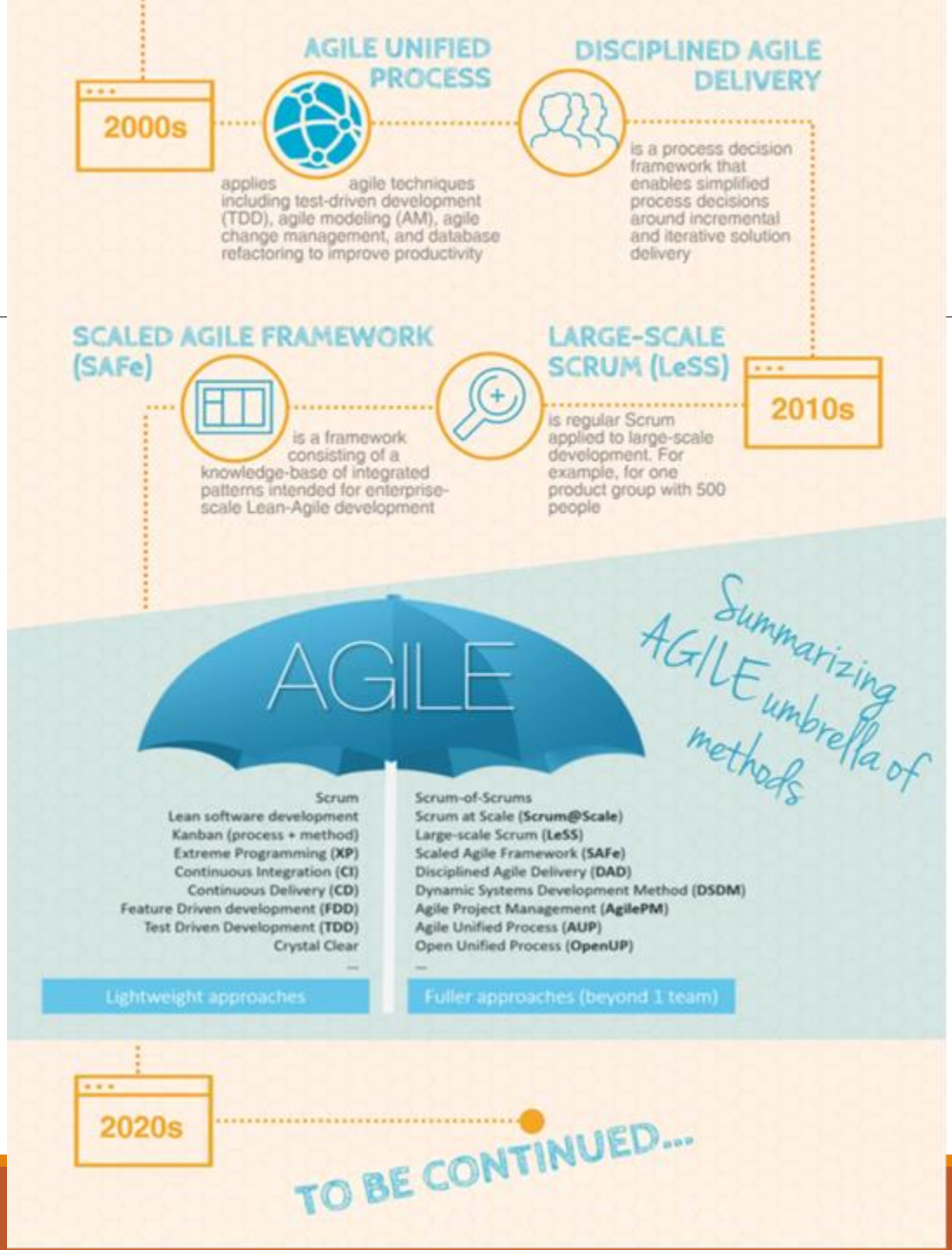
Introduction

- Most people in an organization are involved with an information system of some kind.
- For the organization to create and use the system requires thought and effort.
- In this chapter, you learn about history of software development methodology, six step process for performing systems analysis and design.


A Brief History of
Software Development
Methodologies
STRUCTURED PROGRAMING
1950s
IMPROVES:
Development time
CLARITY
Quality
BY EXTENSIVE USE OF:
Block Structures
Subroutine
FOR and WHILE loops
WATERFALL
1960s
Requirement
Design
Implementation
Verification
Maintenance
is a sequential (non-iterative) process which is seen as flowing steadily downwards through the phases
ITERATIVE & INCREMENTAL
1970s
idea is to develop a system through repeated cycles (iterative) and in smaller portions at a time (incremental), allowing to gain knowledge during development of earlier versions
Requirements
Analysis & Design
Implementation
Deployment
Testing
Evaluation
Planning
Initial Planning
PROTOTYPING
early 1980s
is the activity of creating prototypes of software applications, i.e., incomplete versions for users to evaluate the design
Identify basic requirements
Develop initial prototype
Review
Revise and enhance the prototype

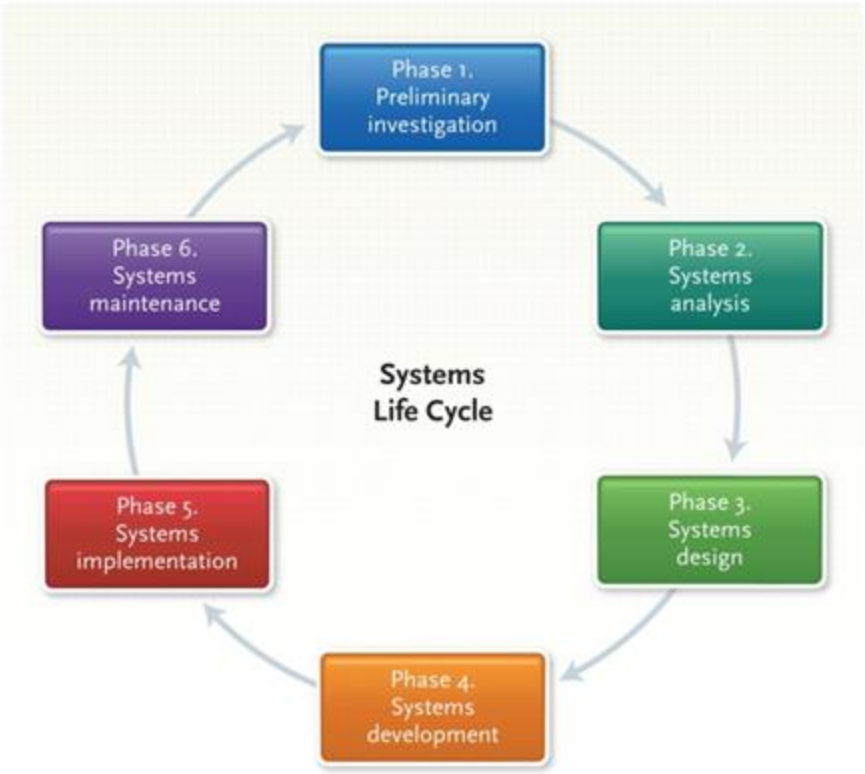

SPIRAL
late 1980s
is a risk-driven process model generaior for software projects
Planning
Risk analysis
Customer communication
Engineering
Customer evaluation
Construction & release
Product maintenance projects
Product enhancement projects
New product development projects
Concept development projects
late 1980s
V-MODEL
is ar extension of the waterfall model.
The process steps are bent upwards after the coding phase, to form the typical V shape
Concept of Operations
Requirements and Architecture
Detailed Design
Implementation
Integration, test, and verification
System verification and validation
Operation and Maintenance
Project Definition
Time
Waterfall era ENDs
PREDICTIVE
ADAPTIVE
Start of AGILE era
RAPID APLICATION DEV
1990s
put less emphasis on planning and more emphasis on process, adaptability and the necessity of adjusting requirements
1990-2000s
AGILE METHODS RISE
Sprint 1
Sprint 2
Final Sprint
CODE
TEST
ACCEPT
LAUNCH
They implement adaptive planning, evolutionary development, early delivery, and continuous improvement, and it encourages rapid and flexible response to change


UNIFIED PROCESS
Characteristics:
1. Iterative and incremental
2. Architecture-centric
3. Risk-focused
DYNAMIC SYSTEMS DEVELOPMENT METHOD
1994
Core Technics:
1. Timeboxing
2. MoSCoW
3. Prototyping
4. Testing
5. Workshop
6. Modeling
7. Configuration Management
1995
SCRUM
Sprint
enables teams to self-organize by encouraging physical co-location or close online collaboration of all team members, as well as daily face-to-face communication
EXTREME PROGRAMMING (XP)
advocates frequent "releases" in short development cycles, introducing checkpoints for requirements adaptation
CRYSTAL
1996
is lightweight, adaptable aproach with specific tailored set of policies, practices, and processes based on unique characteristics
1997
FEATURE-DRIVEN DEVELOPMENT
FDD's purpose is to deliver tangible, working software repeatedly in a timely manner.
Develop overall model
Build feature list
Plan by feature
Design by feature
Build by feature
MANIFESTO
for Agile Software Development
2001


2000s
AGILE UNIFIED PROCESS
applies agile techniques including test-driven development (TDD), agile modeling (AM), agile change management, and database refactoring to improve productivity
DISCIPLINED AGILE DELIVERY
is a process decision framework that enables simplified process decisions around incremental and iterative solution delivery
SCALED AGILE FRAMEWORK (SAFe)
is a framework consisting of a knowledge-base of integrated patterns intended for enterprise-scale Lean-Agile development
LARGE-SCALE SCRUM (LeSS)
is regular Scrum applied to large-scale development. For example, for one product group with 500 people
2010s
AGILE
Summarizing AGILE umbrella of methods
Scrum
Lean software development
Kanban (process + method)
Extreme Programming (XP)
Continuous Integration (CI)
Continuous Delivery (CD)
Feature Driven development (FDD)
Test Driven Development (TDD)
Crystal Clear
...
Lightweight approaches
Scrum-of-Scrums
Scrum at Scale (Scrum@Scale)
Large-scale Scrum (LeSS)
Scaled Agile Framework (SAFe)
Disciplined Agile Delivery (DAD)
Dynamic Systems Development Method (DSDM)
Agile Project Management (AgilePM)
Agile Unified Process (AUP)
Open Unified Process (OpenUP)
...
Fuller approaches (beyond 1 team)
2020s
TO BE CONTINUED...

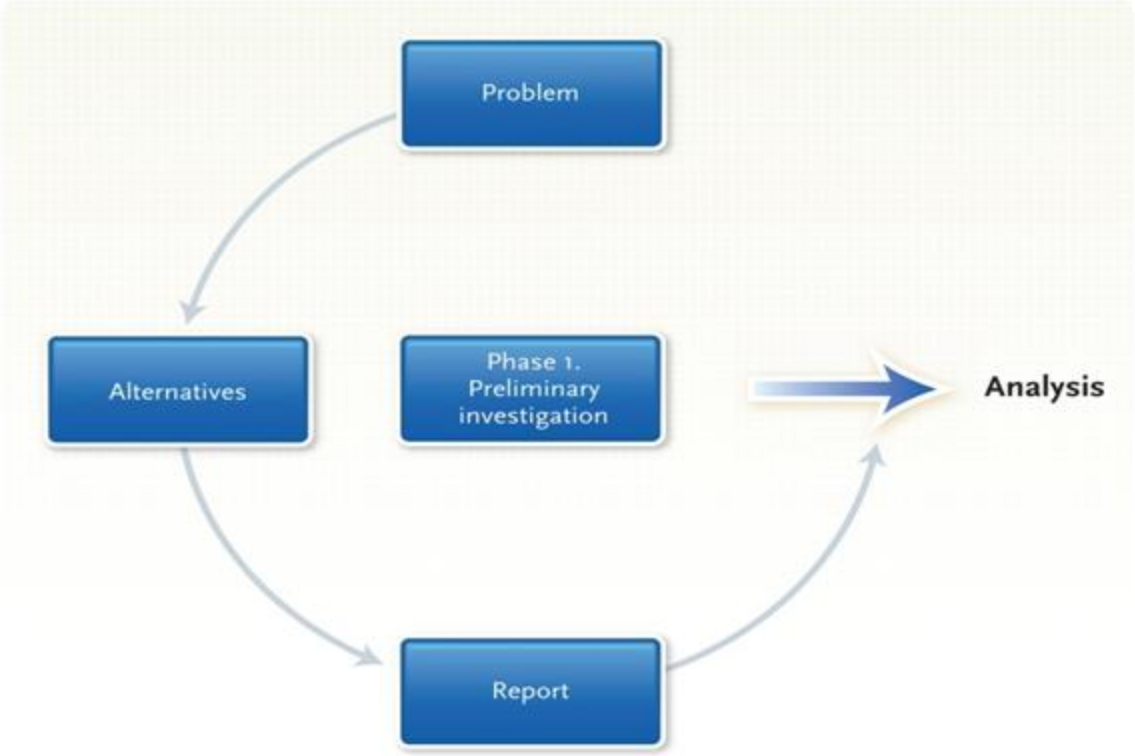
System Analysis and Design

Six-phase problem-solving procedure for examining and improving an information system



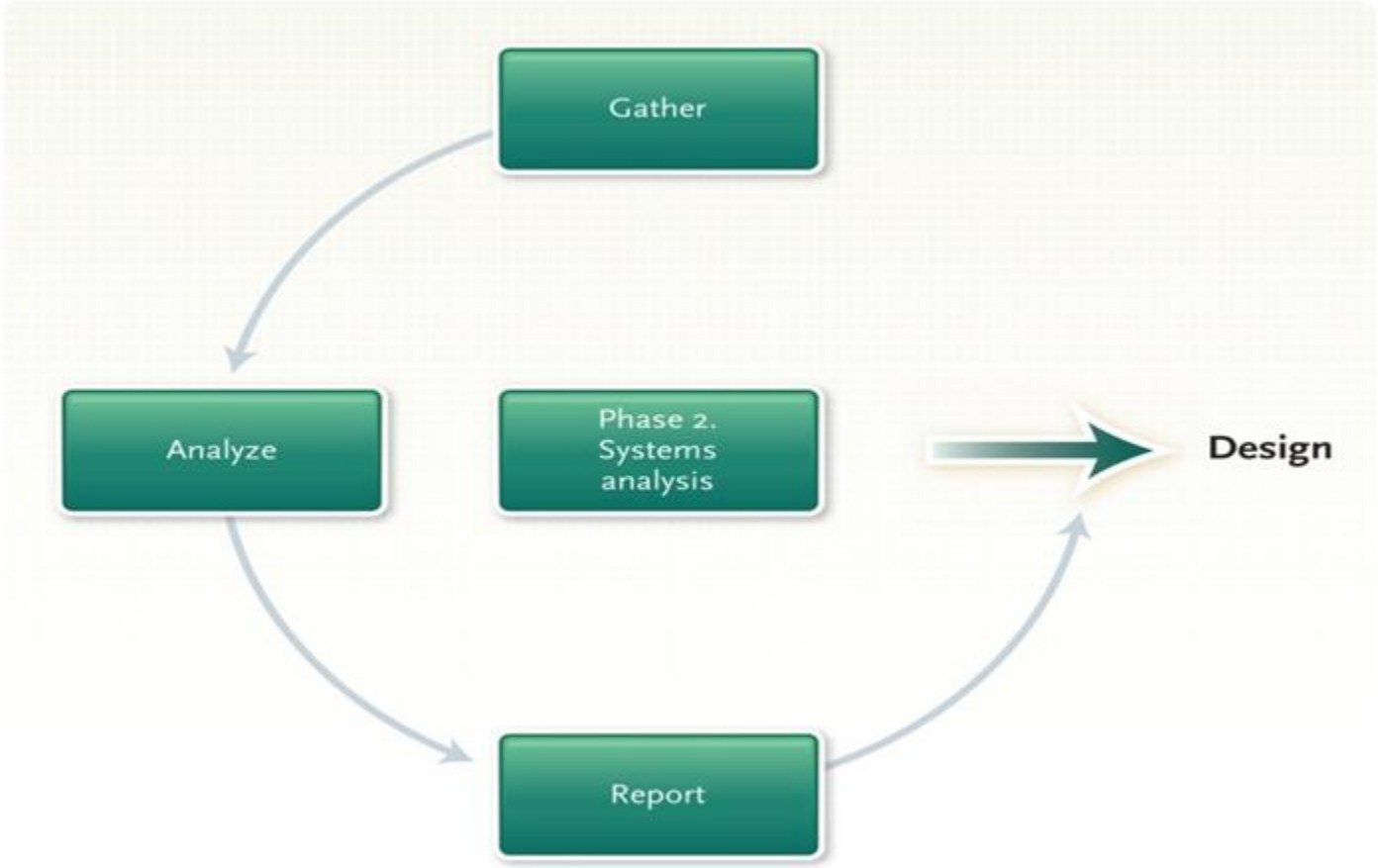
Phase 1: Preliminary Investigation

The preliminary investigation determines the need for a new information system



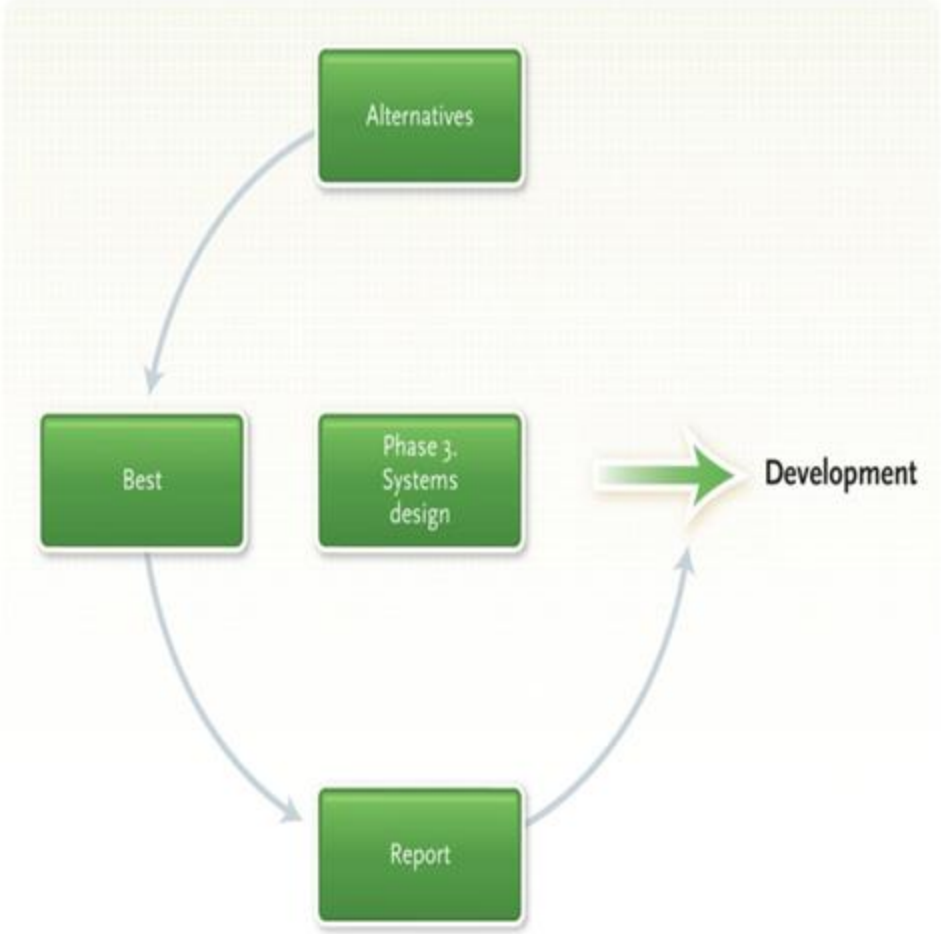
Phase 2: Systems Analysis

Data is collected about the present system and then analyzed to determine the new requirements



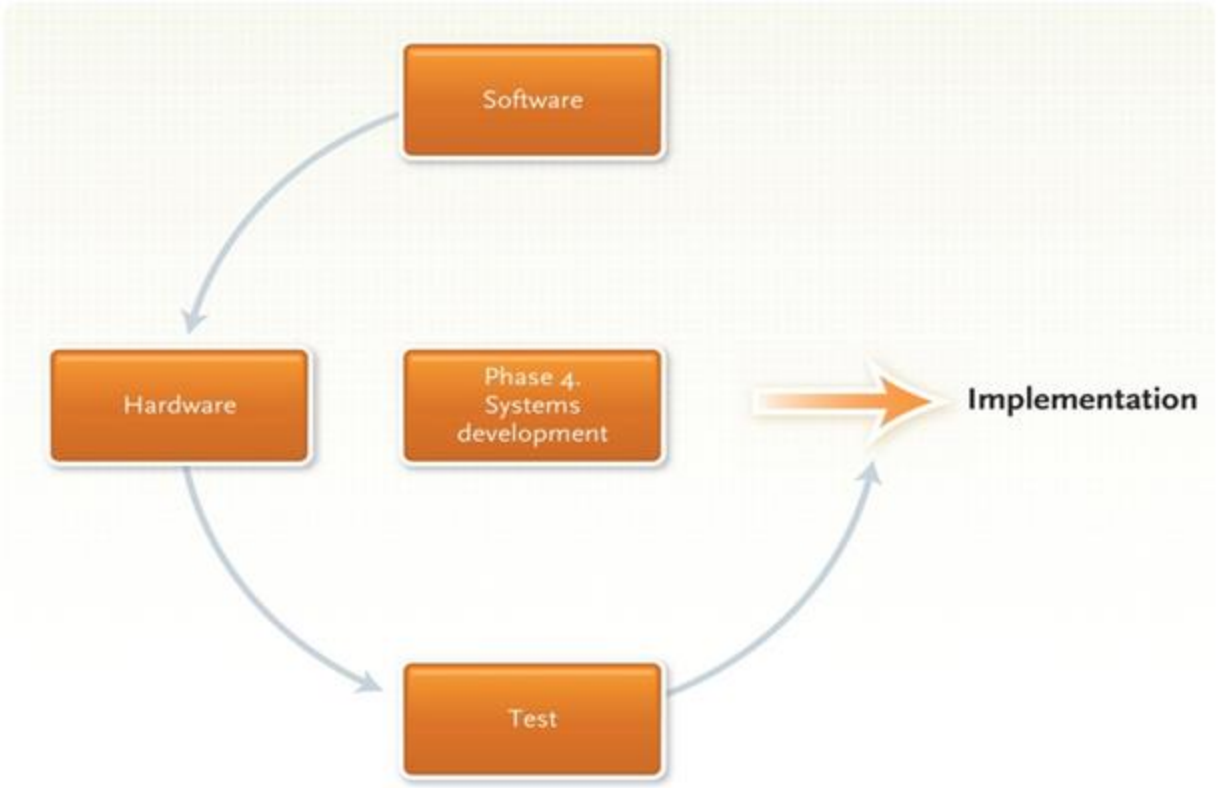
Phase 3: Systems Design

- Define the alternatives, select the best system, and write a systems design report
- Evaluate systems according to economic feasibility, technical feasibility, and operational feasibility



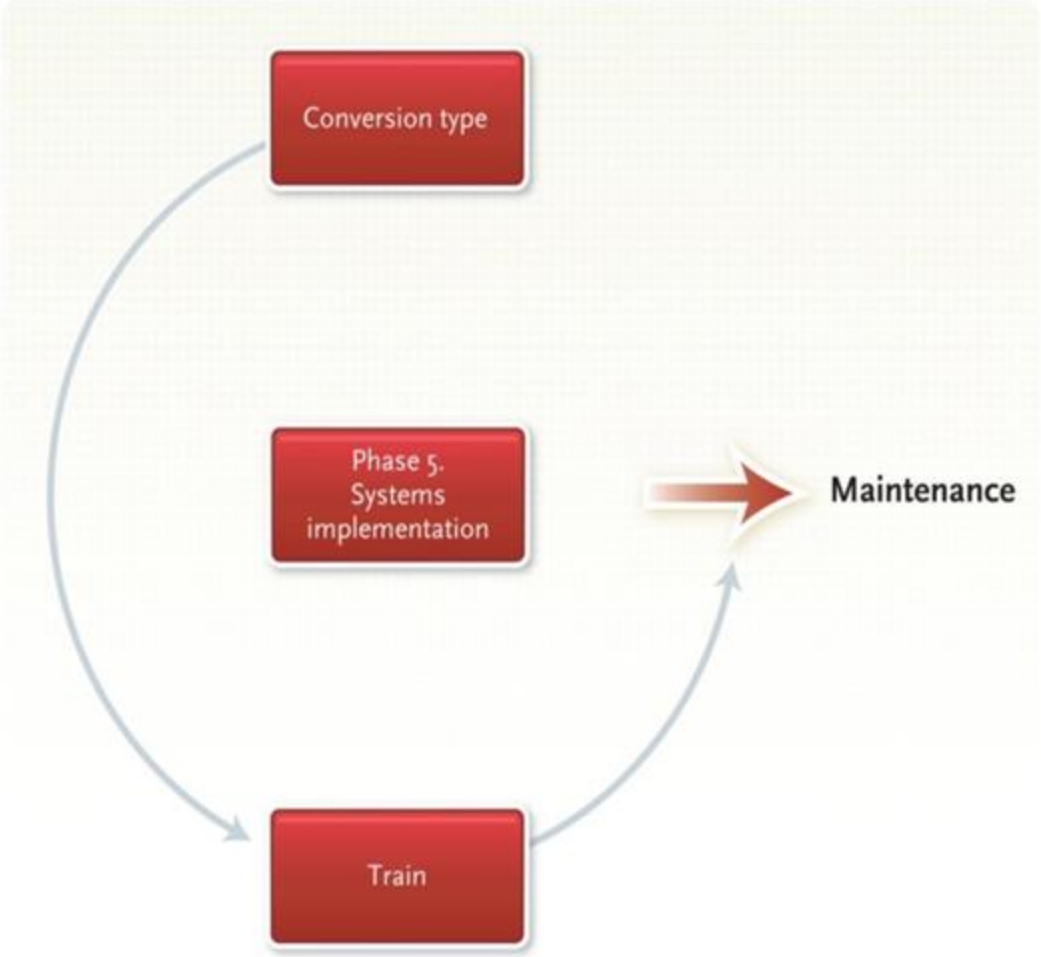
Phase 4: Systems Development

In the development phase, you acquire the software and hardware, and test the new system



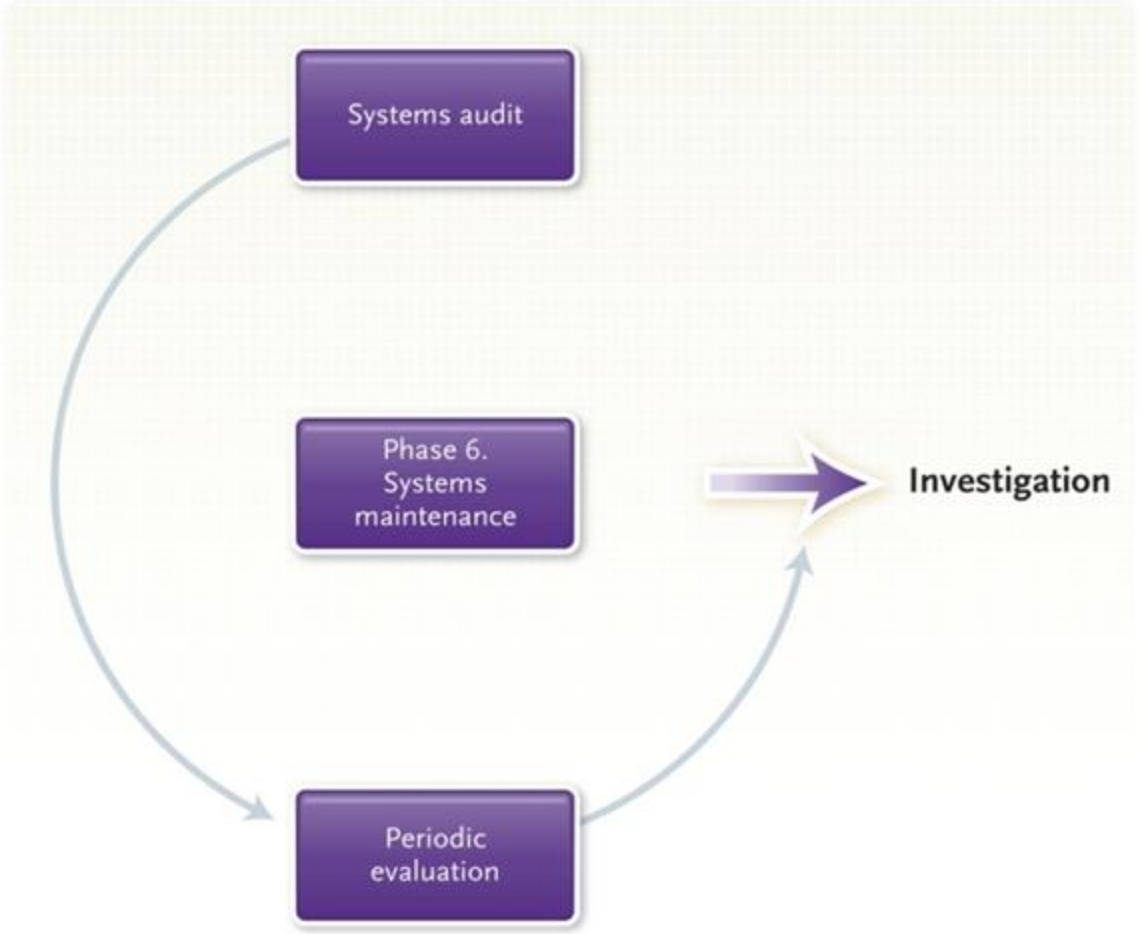
Phase 5: Systems Implementation

- Also known as conversic
- Converting from the old system to the new one
- Training people to use t new system
- Types of conversion approaches include:
  - Direct
  - Parallel
  - Pilot
  - Phased



Phase 6: Systems Maintenance

Systems maintenance is a very important, ongoing activity that includes a systems audit and a periodic evaluation



Prototyping and Rapid Applications Development

Alternatives to the systems life cycle may be used if the system is not feasible

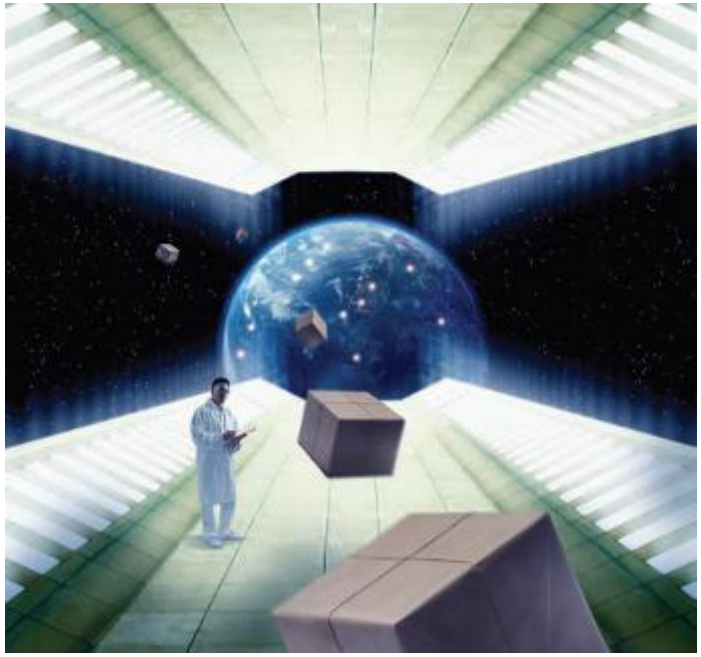
- Prototyping is building a model
- Rapid applications development (RAD)

Careers in IT

- A systems analyst plans and designs new systems, following the systems life cycle
- Requires a Bachelor's degree in Computer Science or Information Systems and technical experience

- Can expect to earn an annual salary of RM 48,306 to RM 72,600

A Look to the Future

The Challenge of Keeping Pace

- To stay competitive with today's fast business pace, new technologies must be incorporated
- Increased use of RAD and prototyping
- Increased use of outside consulting