Introduction to Management Information Systems

System Development Lifecycle

Business Application

Learning objectives

- To be aware of the phases of the development life cycle
- To know what system development should include.
- To know what is involved in project management.
- To be familiar with the stages in the development of a program or system.
- To be familiar with tools associated with stages in the development life cycle

What is System Development?

System development is a set of activities used to build an information system

A **system** is a set of components that interact to achieve a common goal	An **information system** (**IS**) is a collection of hardware, software, data, people, and procedures that work together to produce quality information	System development activities are grouped into **phases**, collectively called the **system development life cycle** (**SDLC**)

What is System Development?

System development should follow three general guidelines:

- Group activities or tasks into phases
- Involve **users**
- Define **standards**

What is System Development?

- During system development, members of the project team gather data and information using several techniques

Review documentation	Observe	Survey
Interview	JAD Sessions	Research

Systems Development Life Cycle (SDLC)

1. Planning
2. Analysis
3. Design
4. Implementation
5. Maintenance

Systems Development Life Cycle (SDLC)

1. Planning (preliminary investigation)
2. Systems analysis (requirements gathering)
3. Systems design
4. Systems implementation
5. Systems maintenance

Some sources state there are 6 stages with systems development between design and implementation

System Development Life Cycle

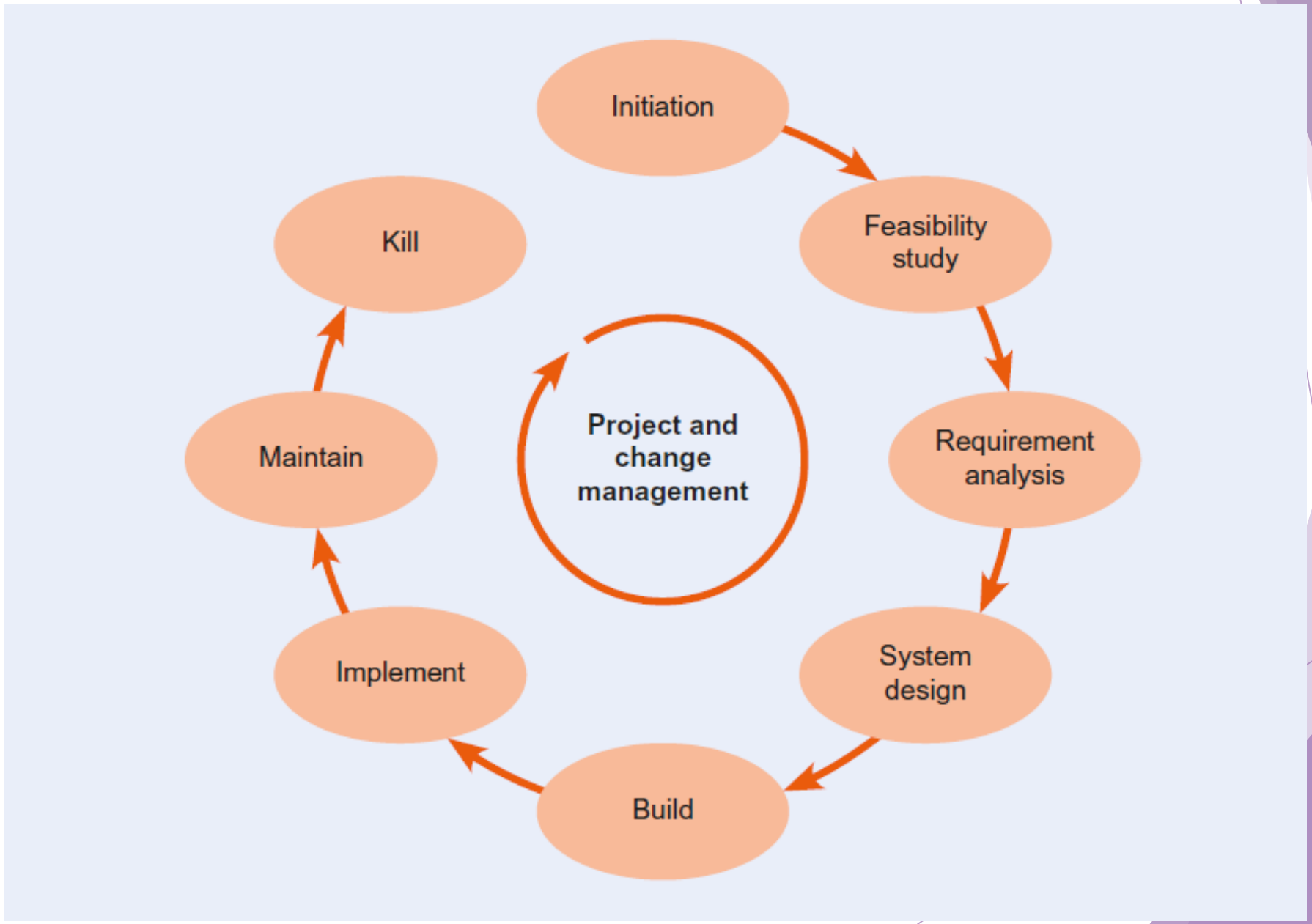
project feasibility and testing carried out throughout the lifecycle

Phase 1: Planning

SDLC

- systems development lifecycle (SDLC) model
  - developed by National Computing Centre in the UK in 1969
- before systems
  - failed to meet user needs,
  - functionally inadequate or
  - too inflexible to meet changing business needs
- 5 main stages but also
  - development, programming
  - project management and change management

Systems Development Life Cycle (SDLC)



critical stages

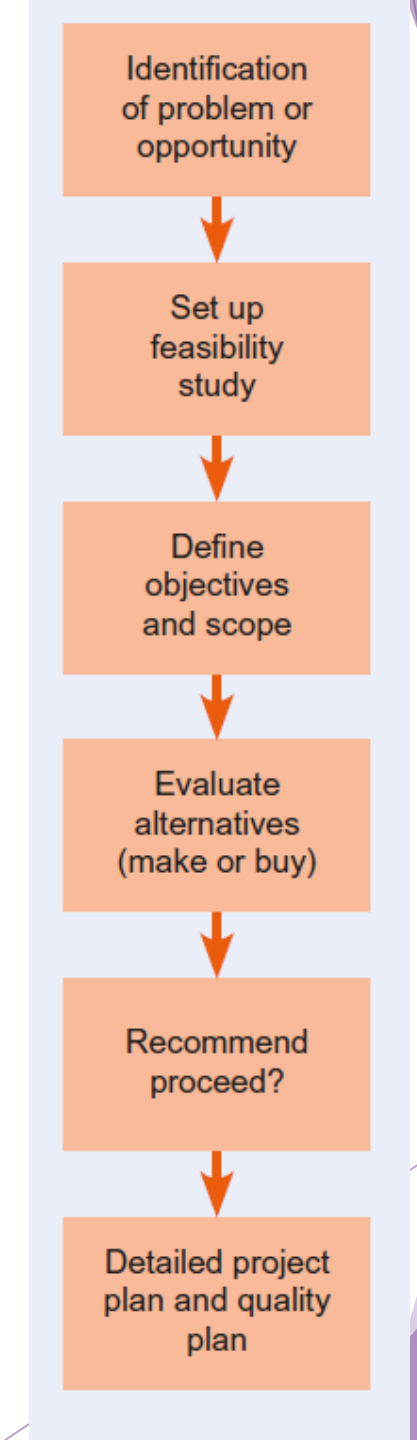
- many information systems fail
- projects overrun in time or budget, or
- they do not deliver the benefits expected
- major factor is poorly managed initiation stage
- this is followed by the feasibility study
- these 2 stages are crucial to the success of the deployment and development of an information system

why initiate an IS project?

- *Capability* – achieve something unable before
- *Cost savings* – core business process improved
- *Respond to change* - legislation, changing business environment
- *Reach* – expansion of customer base
- *Control* - better information delivery for managers
- *Competitive advantage* – e.g. home shopping service (Tesco)
- *Improved internal information flows* – improve over poor legacy systems
- *Improved external information flows* – business service, reputation
- *Improved customer service*

initiation stage

- problem identification
- feasibility study
- define objectives & scope
- evaluate choices / alternatives
- proceed?
- project plan
  - schedule, team, responsibilities



initiation stage

is the project feasible?

prepare to ensure the project is successful

part of the initiation phase

Input: creative thought and/or systematic evaluation of IS needs.

Output: idea for initiation of a new information system.

initiation

Managing director or other senior management

- likely to have support

Information systems department

- part of overall IS/IT strategy;
- still need high-level management support

Functional business area

- competing with other development projects
- have a steering committee to decide on development priorities

Conduct a preliminary investigation

- Conduct a preliminary analysis
- Propose alternative solutions
  - Interview people within the organization
  - Study what competitors are doing
  - Decide to leave the system as is, improve it, or develop a new system

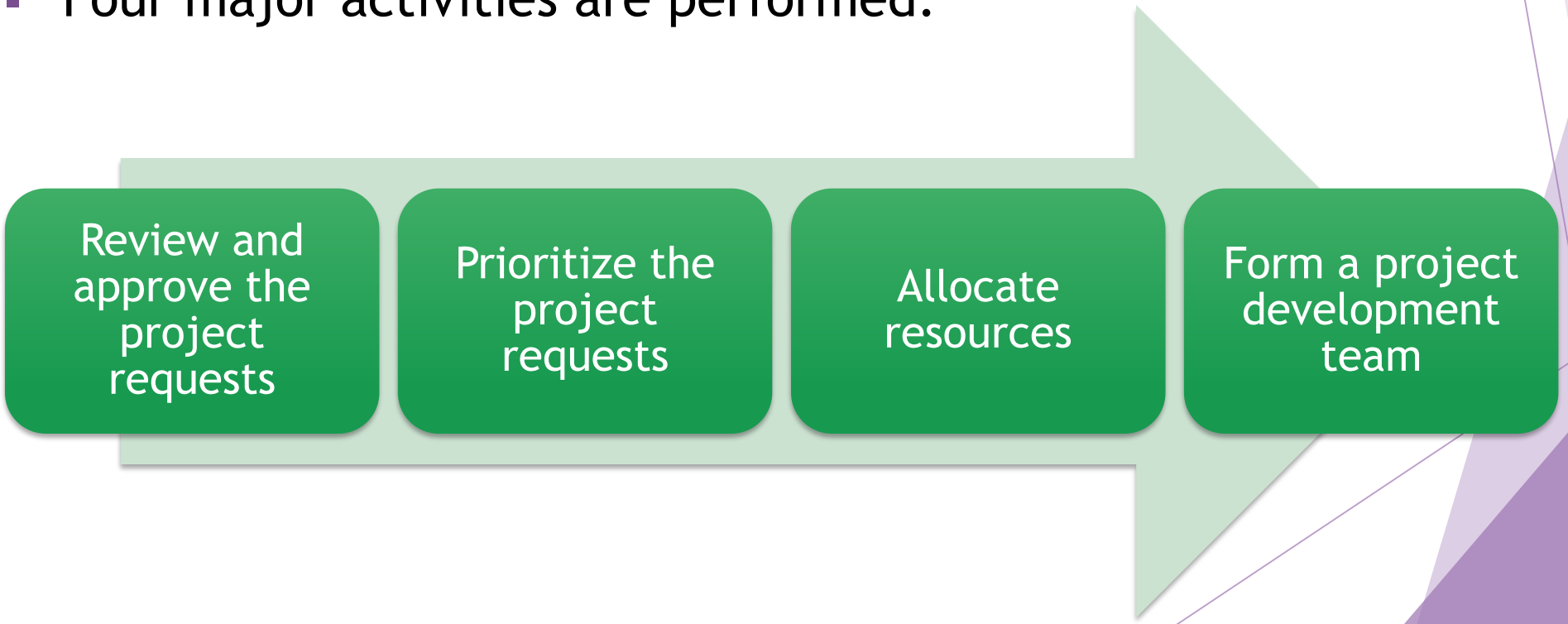
Planning

Conduct a preliminary investigation

- Describe costs and benefits
- Submit a preliminary plan with recommendations
  - written report
  - Get management approval

Planning

- The planning phase for a project begins when the steering committee receives a project request
- Four major activities are performed:



Gantt Chart

A popular tool used to plan and schedule the time relationships among project activities.

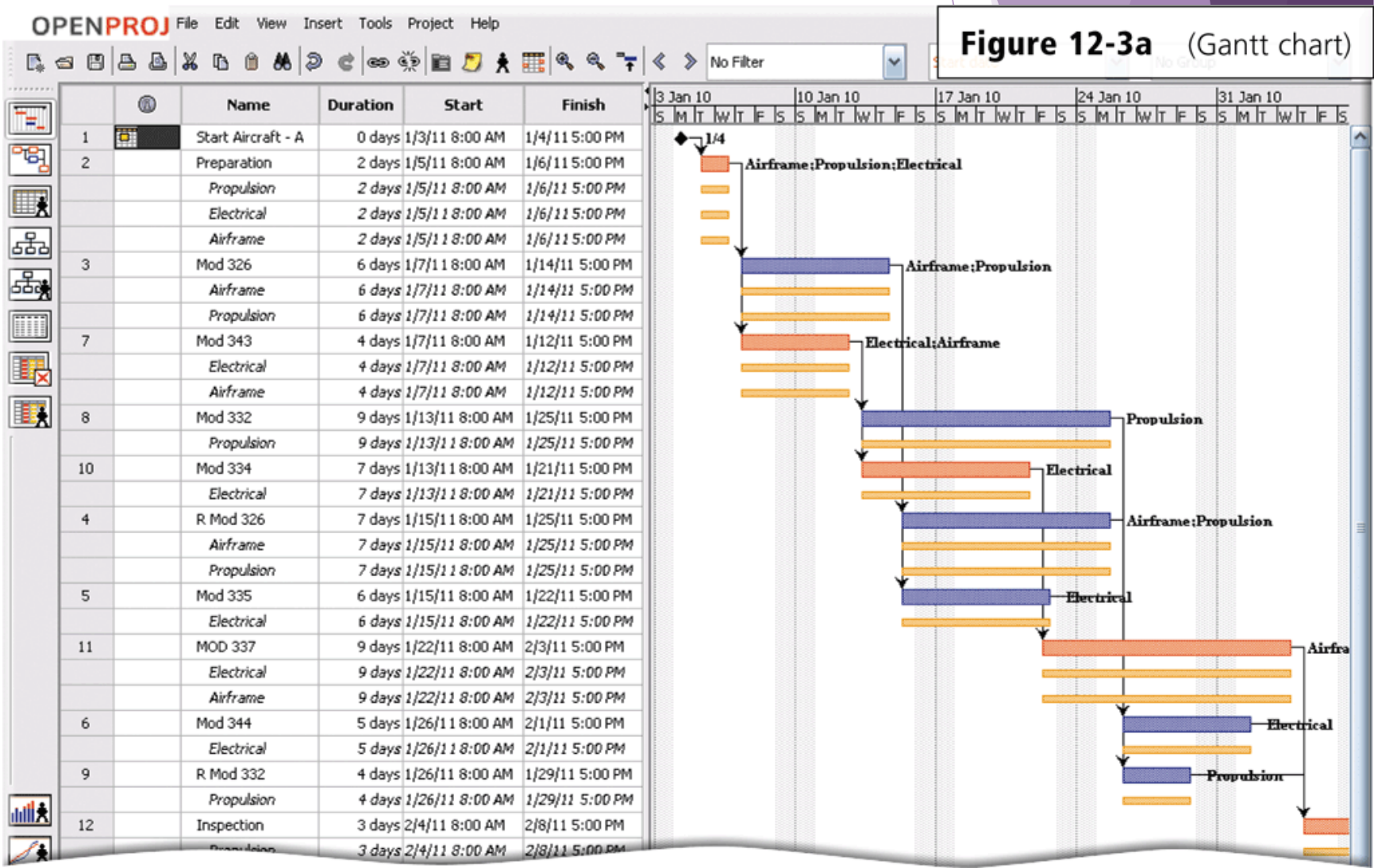


Figure 12-3a (Gantt chart)

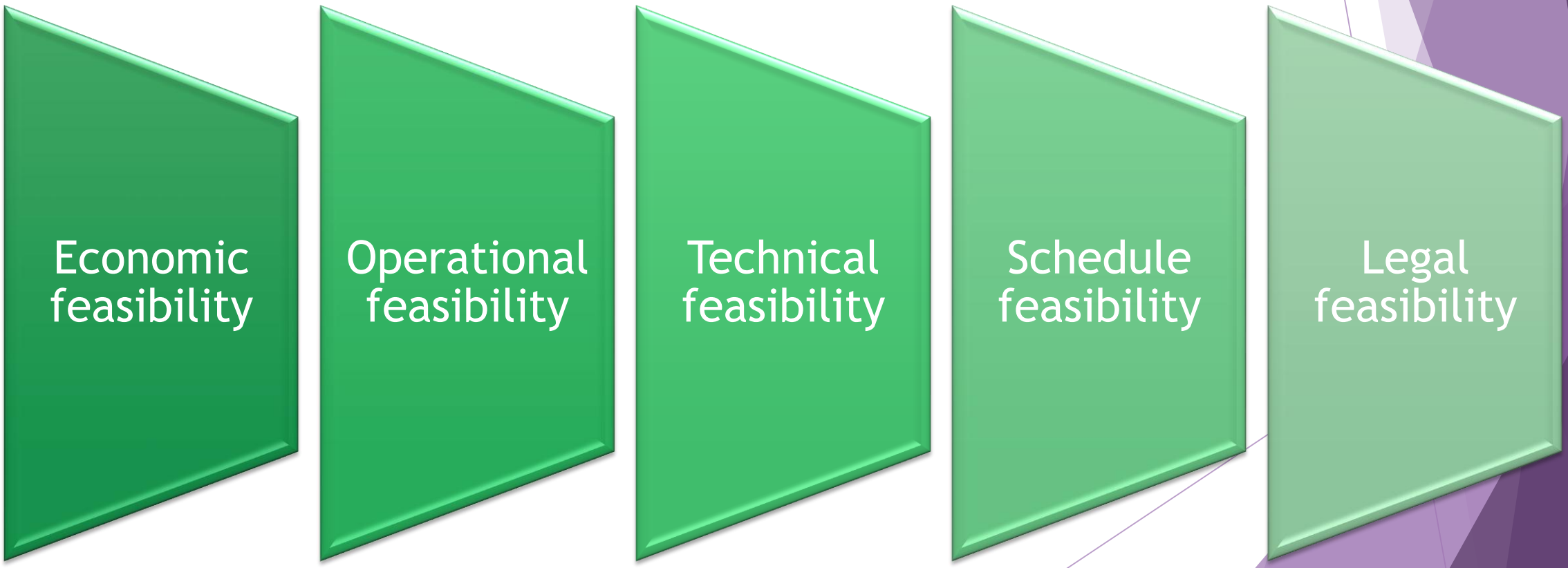
feasibility assessment

- ensure that the project is a viable business proposition
- need for and impact of the system
- considers different alternatives for acquiring software

- *Input*: idea for initiation of a new information system
- *Output*: feasibility report and recommendation to proceed

Feasibility Study

Feasibility is a measure of how suitable the development of a system will be to the organization



Feasibility Study

Feasibility type	Scope	Question answered	Technique used to control
Organisational	Alignment of the system with organisational needs. Impact of system on organisational practice.	Will the system meet the business's needs and help improve its performance?	Critical success factors and key performance indicators. Change management.
Economic	Evaluation of the relative costs and benefits of the new system.	Will the costs outweigh the benefits?	Cost–benefit analysis. Return-on-investment and payback calculations.
Technical	Evaluation of possible technical problems and their solutions.	Will the system work efficiently?	Risk analysis. Capacity planning. Performance and availability modelling.
Operational	Evaluation of likely response to system by its users and management.	Will the system be accepted by end-users into their day-to-day work?	Risk analysis. Change management. Usability analysis.

Feasibility Study

organizational feasibility

economic feasibility

technical feasibility

operational feasibility

scheduling feasibility

legal feasibility

Organizational feasibility

- how closely the solution will match the needs of the organization
- identifies problems that may arise in this area
- how well the proposed system fits in with
- the company’s overall business and IS strategy
- are there better options?

the mission and objectives of the company are translated into information systems requirements

Organizational feasibility

COBIT

- Control OBjectives for Information Technology
- IT governance model
- matching an IT solution to the needs of the organization

Organizational feasibility

Critical Success Factors (CSFs)

- align new system with business objectives
- can these objectives be achieved?
- use KPIs (Key Performance Indicators)
  - to set CSF targets
  - measure if targets met
  - during the SDLC - all phases

"KPIs are the lead indicators that define measures of how well the IT process is performing in enabling the goal to be reached"

Organizational feasibility

- how the potential users' skill sets and attitudes will affect the system
- increased resistance to change from users
- counter measures to resistance
  - education
  - training

Business objective	Critical success factor	KPI
1 Improve order fulfilment	Ship to target	Percentage of systems that ship on time exactly as the customer specified
2 Increase product performance	Initial field incident rate	Frequency of problems experienced by customers
3 Enhance post-sale service	On-time, first-time fix	Percentage of problems fixed on the first visit by a service representative who arrives at the time promised

Organizational feasibility

- large organizations can have wide-reaching affects
- change working practices
- job description / needs
- balance of power between departments
- alter communication channels
- alter control mechanisms
- need to consider how to ‘manage’ change

Economic feasibility

cost & benefits -> net gain

tangible & intangible costs

tangible

- savings on staff costs
- efficiency
- improved sales

Economic feasibility

intangible costs

- costs if system not implemented
- improved staff conditions
- improved staff moral
- customer satisfaction
- staff efficiency
- communication

some information can be gathered by surveys

Economic feasibility

development costs

- hardware
- software

time costs

- programming, testing, prototyping

maintenance costs

- equipment, software (licenses)

Economic feasibility

staff costs

- salaries of
  - consultants, analysts, networkers, programmers, data entry, other technical staff
- project staff
- training

Economic feasibility

operational costs

estimated costs of

- implementing the system
- running the system

if the project is over budget, it can be revised or even cancelled

Economic feasibility

cost effectiveness analysis

costs & benefits information required

estimate

ROI return on investment

IRR intended rate of return

finding in the cost-benefit analysis (CBA) report

Feasibility

technical feasibility

- available
- feasible to buy / implement / use
- is the organization ready to use it?

Feasibility

operational feasibility

- how will it work, be accepted?
- will it be used, be good, meet its goals?
- will it have other affects (e.g. customers)?

Feasibility

scheduling feasibility – project time frame, ‘on time’

legal feasibility – any legal issues

feasibility occurs throughout the project lifecycle

final exam

according to the CMU notice

Thursday 20th March,
3.30-6.30 pm
room TBA

Phase 2: Analysis

Analysis Phase

Conduct a preliminary investigation

- Determines and defines the exact nature of the problem or improvement
- Interview the user who submitted the request

Perform detailed analysis

- Study how the current system works
- Determine the users' wants, needs, and requirements
- Recommend a solution

Gather data

- Interview employees and managers
- Develop, distribute, analyze questionnaires
- Review current written documents
- Observe people and processes at work

Analyze data

- system modeling tools,
  - CASE (Computer-Aided Software Engineering) tools
- data flow diagrams (DFD)
  - show how data flows through the system

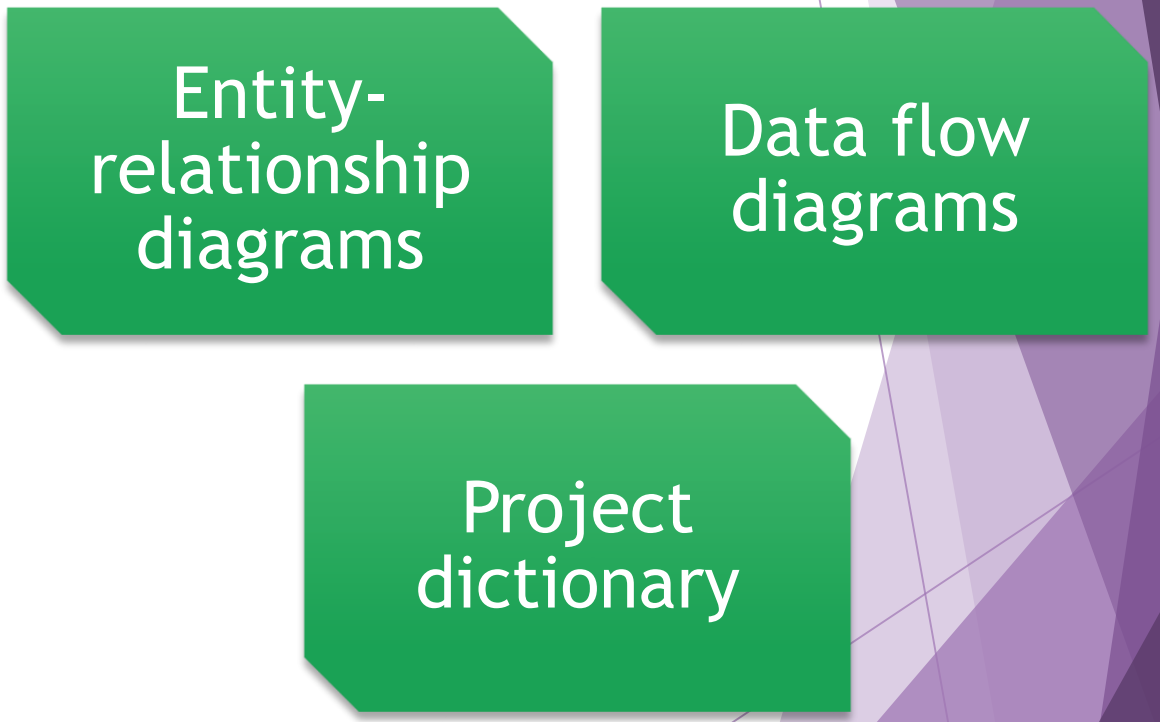
Write a report and get approvals for next phase

- Document how the current system works
- Document problems with the current system
- Describe the requirements for the new system

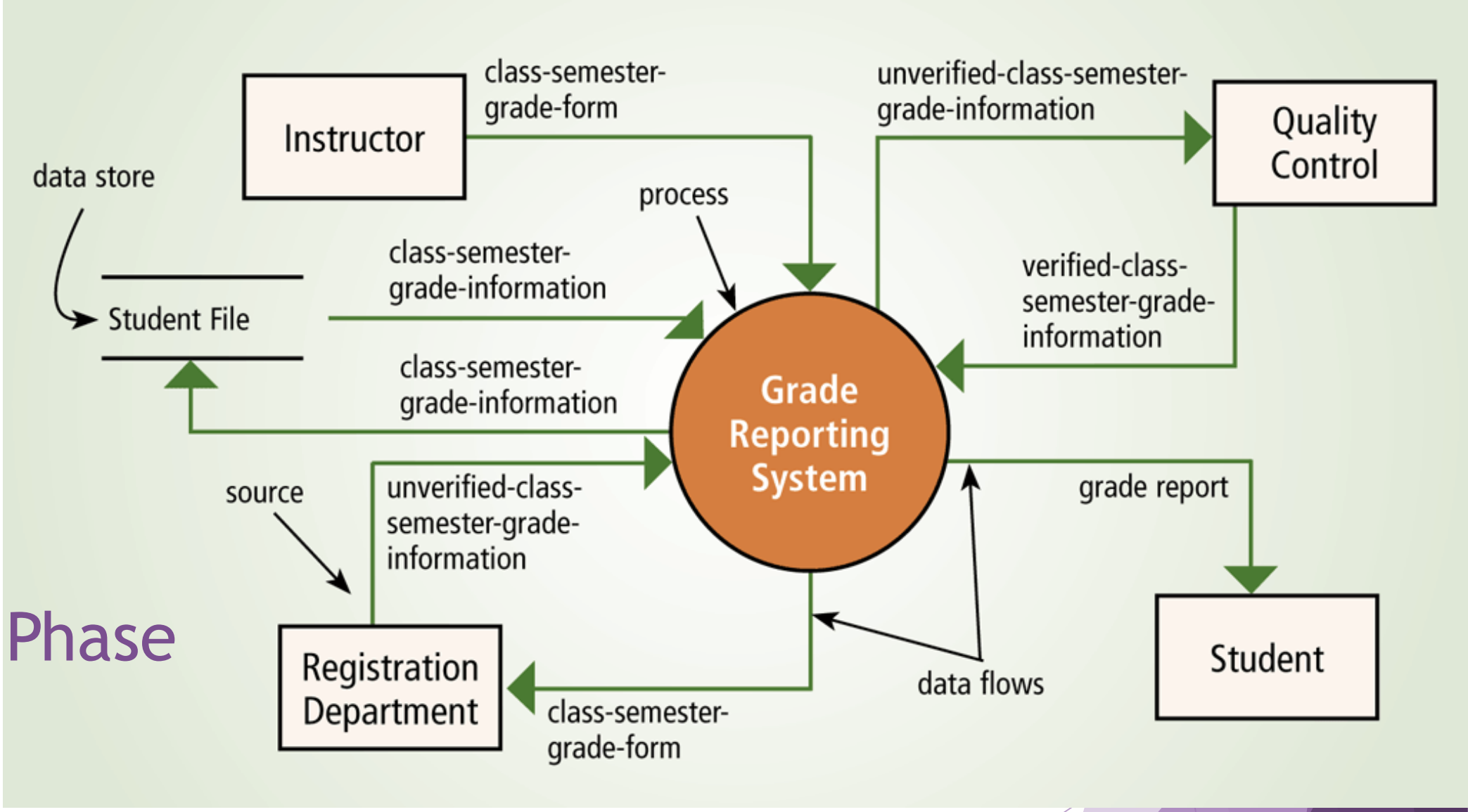
Analysis Phase

Process modeling

- structured analysis and design
- analysis and design technique
- describes processes that transform inputs into outputs



Analysis Phase

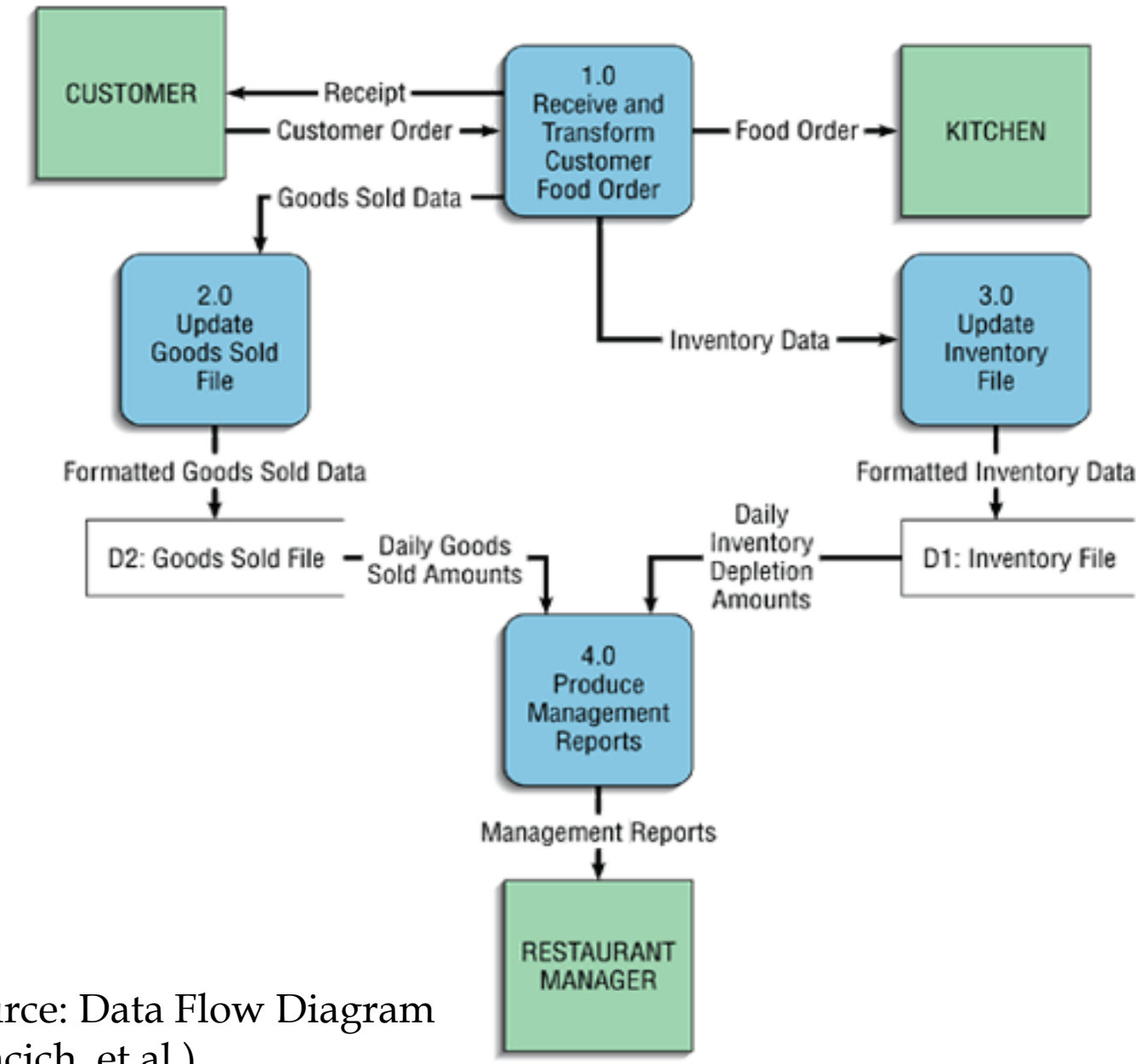


A data flow diagram (DFD) is a tool that graphically shows the flow of data in a system

- Data flows, processes, data stores & sources

Analysis Phase

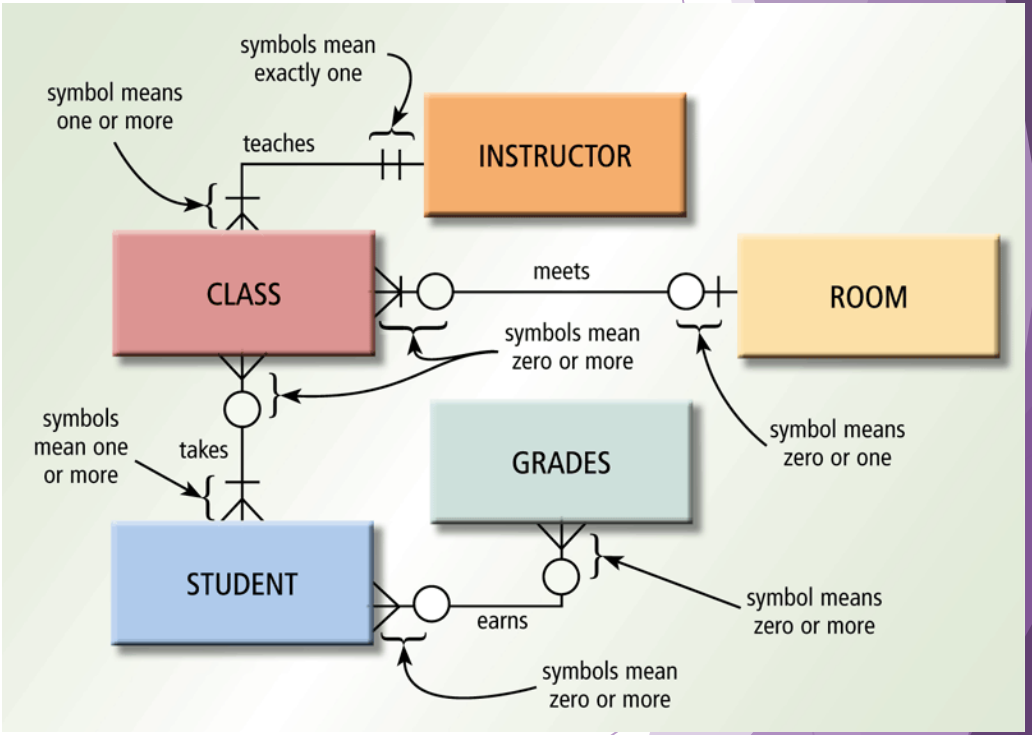
Figure 5.5 Four Separate Processes of the Hoosier Burger Food Ordering System



(Source: Data Flow Diagram Valacich, et al.)

Analysis Phase

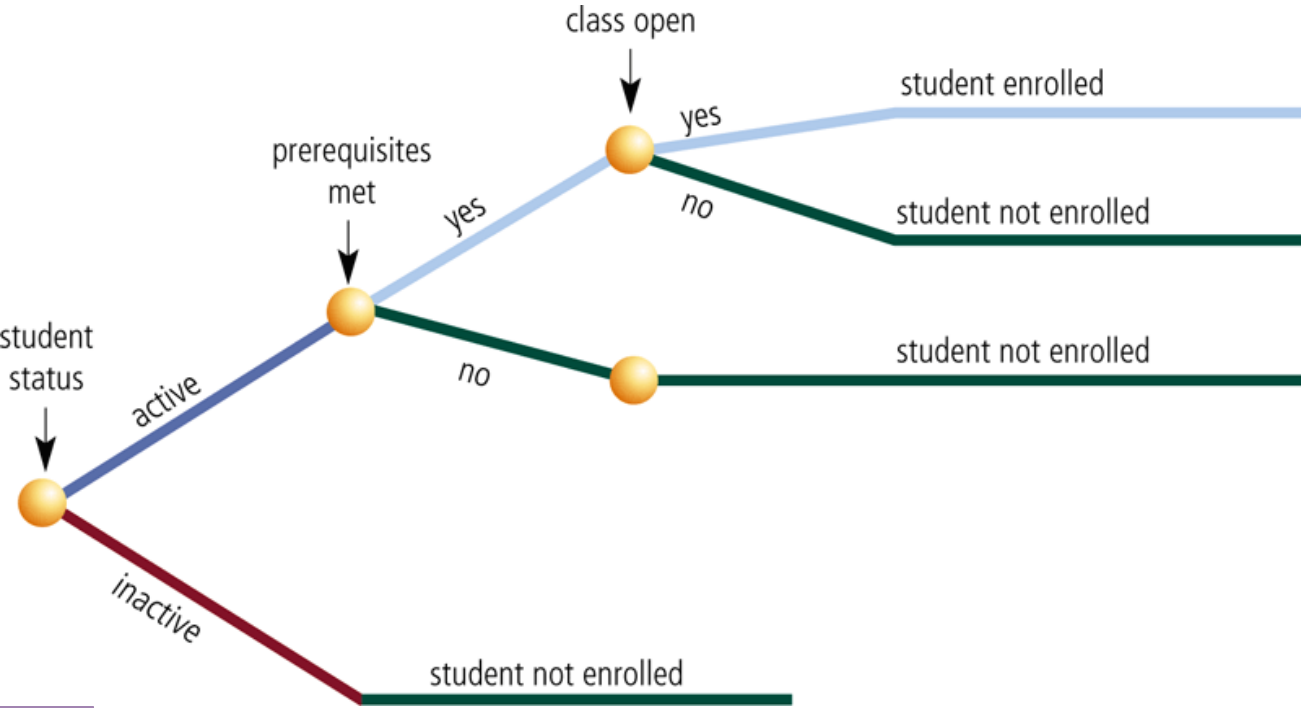
- entity-relationship ER diagram
- graphic tool
- shows connections among entities
- entities are objects that have data



decision table

- lists a variety of conditions and the actions that correspond to each condition

		Rules							
		1	2	3	4	5	6	7	8
Conditions	Student status (A = Active, I = Inactive)	A	A	A	A	I	I	I	I
	Prerequisites met?	Y	Y	N	N	Y	Y	N	N
	Seats available?	Y	N	Y	N	Y	N	Y	N
Actions	Student enrolled	X							
	Student not enrolled		X	X	X	X	X	X	X



A decision tree also shows conditions and actions, but it shows them graphically

Analysis Phase

data dictionary

stores the data item's name, description, and other details about each data item

Date: 12/31/2011 *Project:* HORIZON COMMUNITY COLLEGE *Page:* 11
Time: 10:36:28 AM

Detailed Listing -- Alphabetically
All Entries--Data Flow Diagrams

Student ID — Data Element

Student File::Student ID

Description:
A unique identification number assigned to each student.

Alias:
Student Code

Values & Meanings:
Required element
Cannot be blank
May not be duplicated

Data element attributes

Storage type:	Char
Length:	7
Display Format:	AAAAAAA
Null Type:	NotNull

Location:
File --> Student File

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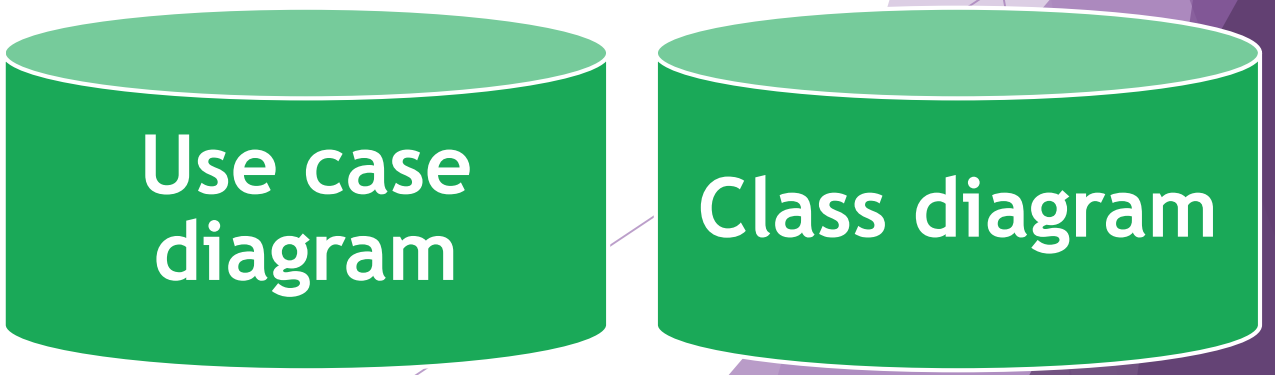
Analysis Phase

Object modeling

- combines the data with the processes that act on that data
- into a single unit, called an object

UML (Unified Modeling Language)

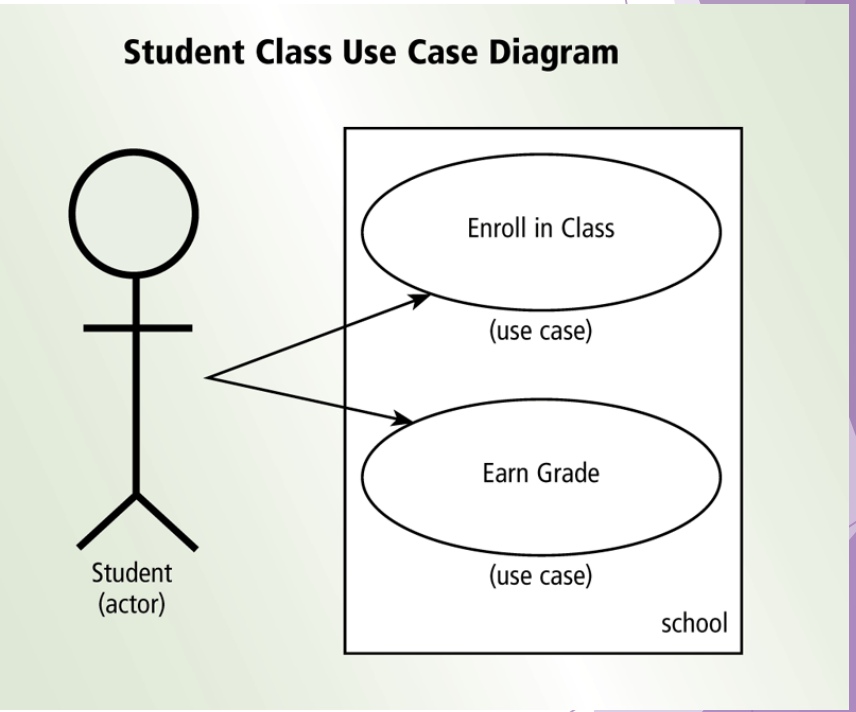
- standard notation for object modeling and development
  - includes 13 different diagrams



Analysis Phase

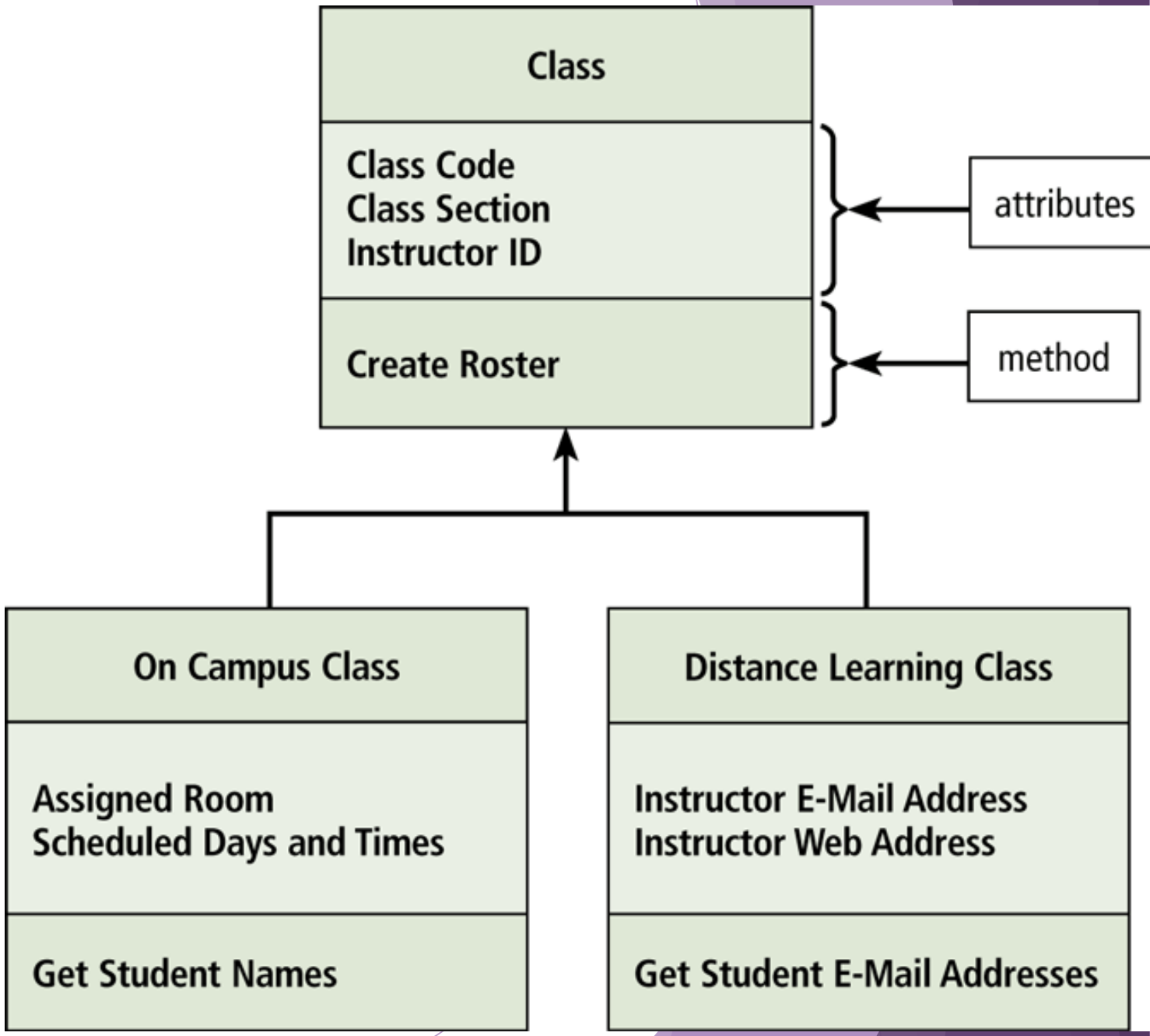
use case diagram

- graphically shows how actors (users) interact with the information system
- considered easy to understand



class diagram

- graphically shows classes and subclasses
- Each class can have one or more subclasses
- Subclasses use inheritance to inherit methods and attributes of higher levels



analysis

the business requirements of a system, from

- talking to, or observing, end-users
- using information sources e.g. existing system docs

Input: terms of reference in feasibility report describing outline requirements.

Output: detailed requirements specification summarizing system functions, with diagrams showing the information flow and processes that are required.

analysis

assessing the precise requirements

3 main tasks

1. gain an understanding of how the current information system works.
2. model current system to ensure that IT and system users agree
3. produce requirements for new IS

analysis

The requirements specification will define:

- the features of the new system
- the scope of the system
  - e.g. functional area or business activities
- the intended users of the new system
- system performance standards
  - e.g. response times, reliability needs
- environment requirements
  - e.g. operating system and hardware

Phase 3: Design

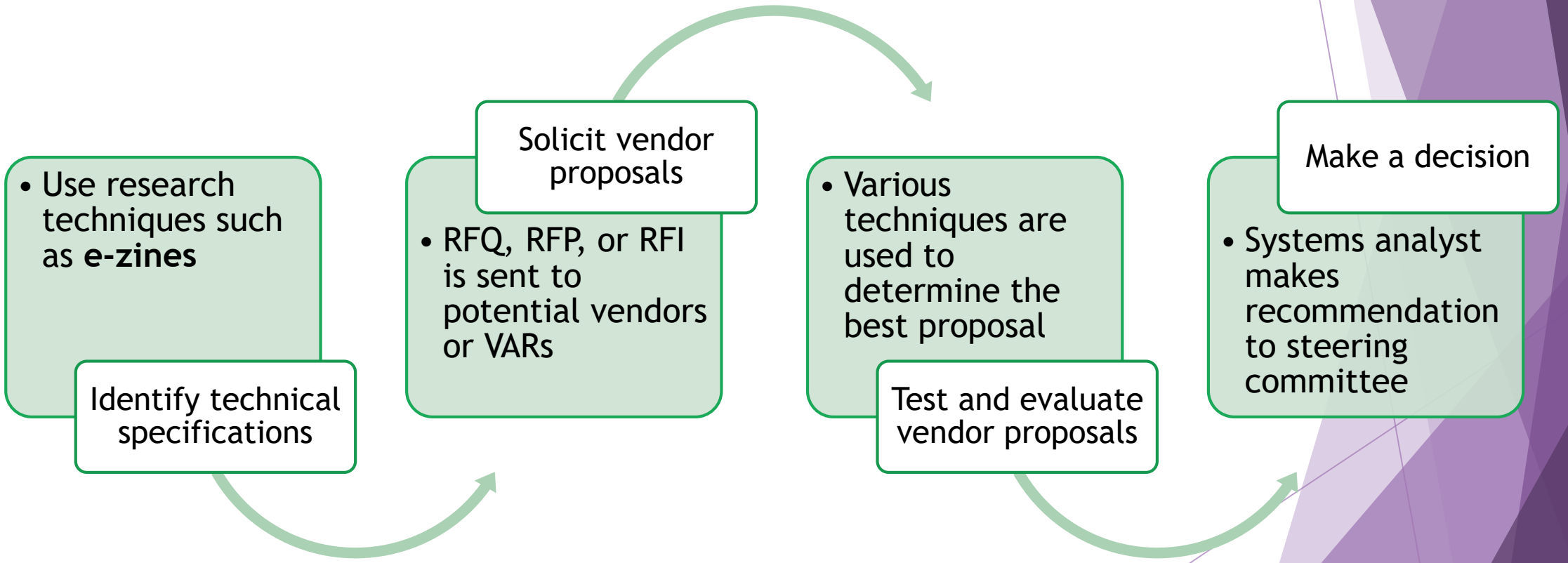
Design Phase

The design phase consists of two major activities

- Acquire hardware and software
- Develop all of the details of the new or modified information system

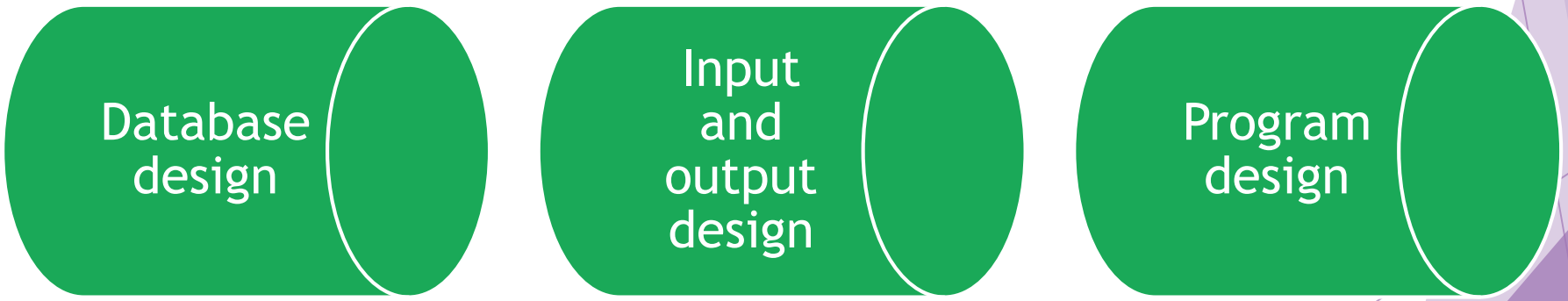
Design Phase

- To acquire the necessary hardware and software:



Design Phase

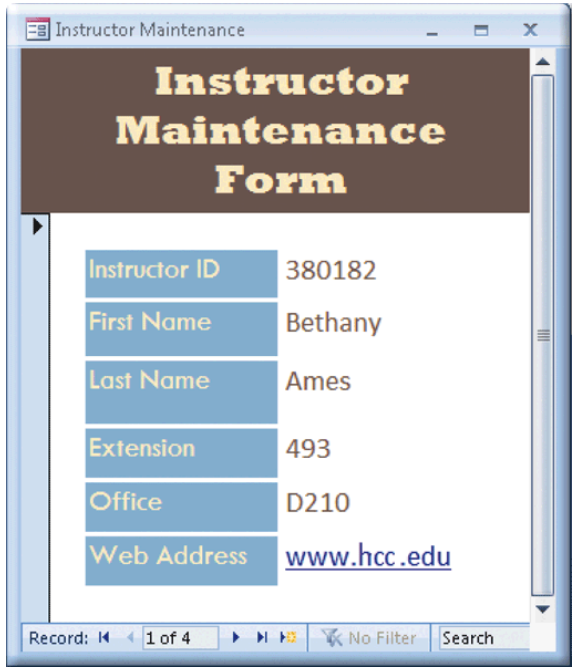
- develop detailed design specifications
- physical design



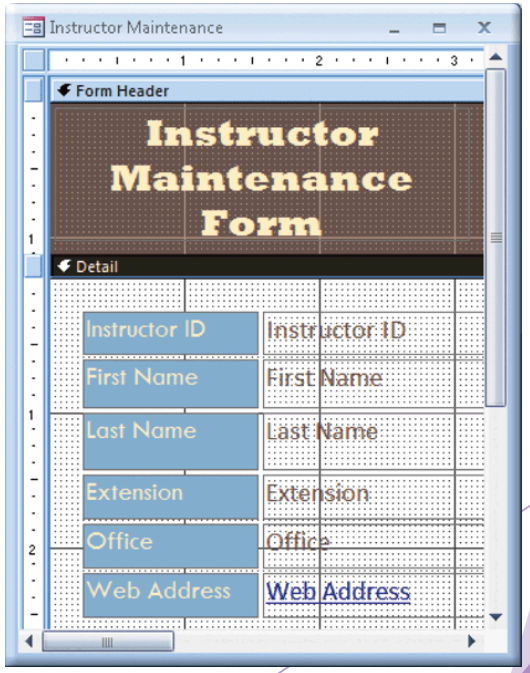
Design Phase

Systems analysts typically develop two types of designs for each input and output

Mockup



Layout chart



Design Phase

- A prototype (proof of concept) is a working model of the proposed system
  - Prototypes have inadequate or missing documentation
  - Users tend to embrace the prototype as a final system
  - Should not eliminate or replace activities

Design Phase

- Computer-aided software engineering (CASE) tools are designed to support one or more activities of system development
- CASE tools sometimes contain the following tools:

Project repository	Graphics	Prototyping
Quality assurance	Code generator	Housekeeping

Develop the system

- Develop or acquire the software
- Acquire and integrate the hardware
- Test the system
  - Unit testing
  - Systems testing with both analysts and end-users
  - End-user testing is critical, as they don’t know the software and will show the developers where they forgot something

system design

- phrase 1 & 2 first!
- preliminary design
  - prototyping
- detail design
  - Input requirements
  - Output requirements
  - Storage requirements
  - Processing requirements
  - System controls
  - Backup
- write a report and get approvals for next phase

design

defines how the system will work

- user interface,
- program modules,
- security and
- database

- Input: requirements specification
- *Output*: detailed design specification

design

- how the proposed information system will delivered
- breakdown of the requirements
- convert requirements into design alternatives
- best selected

system design

detailed design

system design

- choosing database (DBMS)
- data capture
- data storage
- input and output
  - screen design standards
- system navigation
  - e.g. menu systems and GUI
- systems security
- standards for reports

detailed design

- individual system modules
- used in the system build phase
- further define system design

May need to revise system design

- revisit the analysis step
- determine more precisely what the new information system is to do

build

creation of software

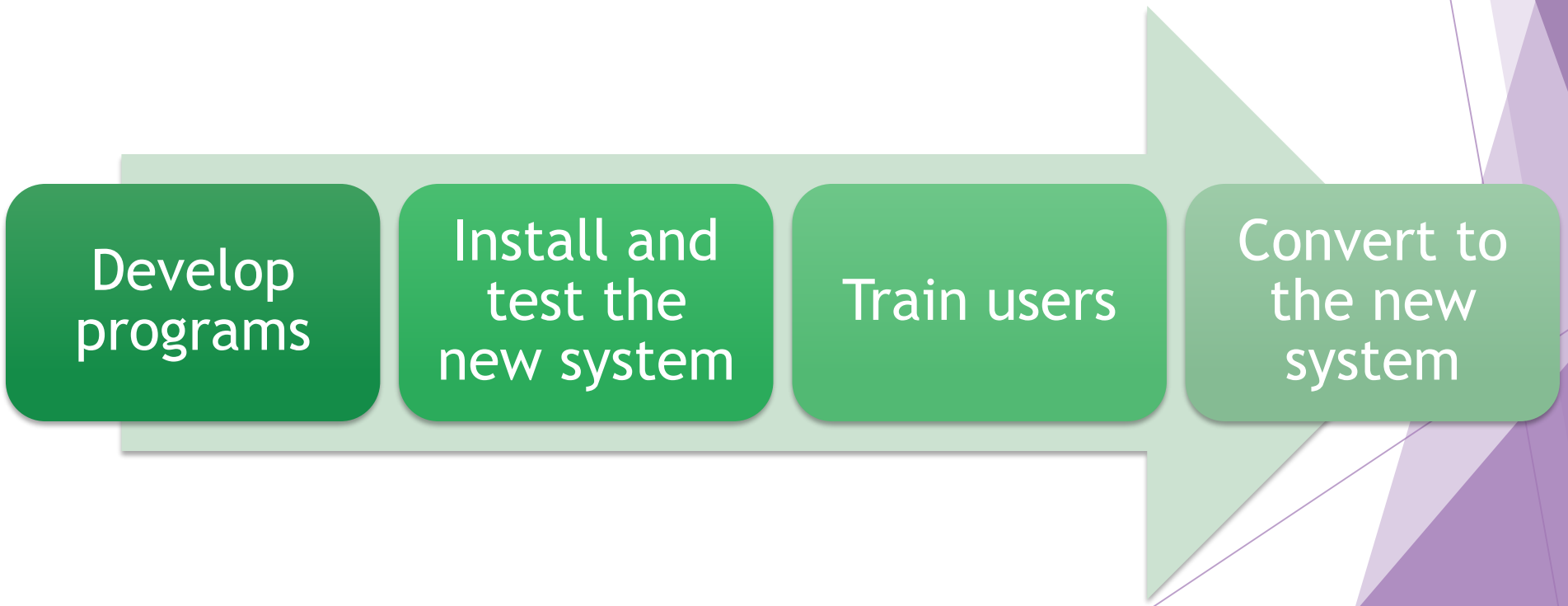
- writing the software code,
- building release versions of the software,
- database design & entry,
- testing by programmers and end-users
- writing of documentation and training
- database construction, programming and testing

- Input: requirements and design specification
- Output: working software, user guides and system docs

Phase 4: Implementation

Implementation Phase

- The purpose of the implementation phase is to construct the new or modified system and then deliver it



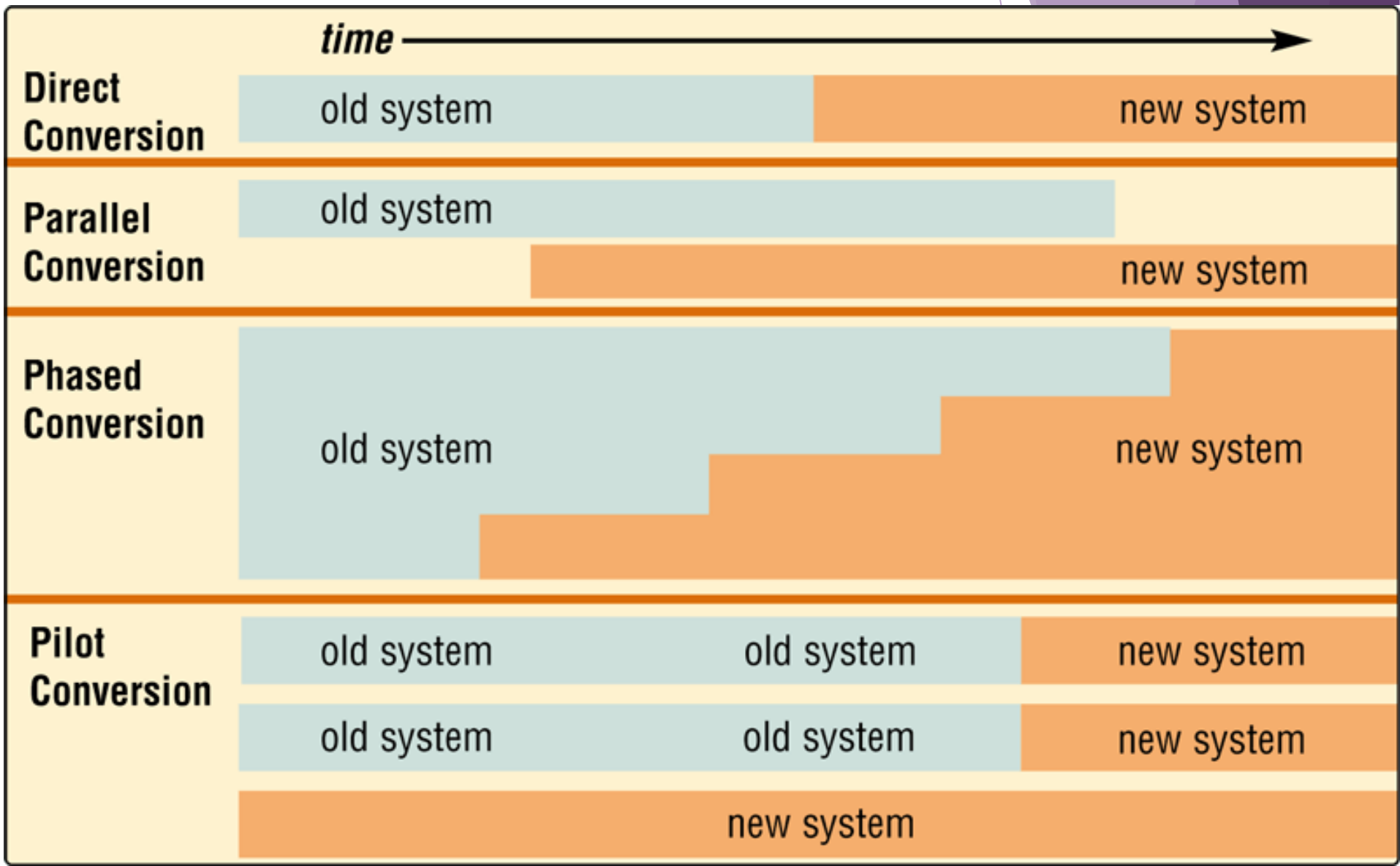
Phase 5: Implement the system

- Choose a strategy to convert to the new system
  - Direct implementation
  - Parallel implementation
  - Phased implementation
  - Pilot implementation
- Train the users
  - Document the system
  - Give classes or train the trainers

conversion strategies

implementation strategy

- Direct implementation
- Parallel implementation
- Phased implementation
- Pilot implementation



training

Train the users

- Document the system
- Give classes or train the trainers

showing users exactly how they will use the new hardware and software in the system

- One-on-one sessions
- Classroom-style lectures
- Web-based training

Implementation Phase

The **program** development life cycle follows these steps:

1. Analyze the requirements
2. Design the solution
3. Validate the design
4. Implement the design
5. Test the solution
6. Document the solution

testing

Unit test

- Verifies that each individual program or object works by itself

Systems test

- Verifies that all programs in an application work together properly

Integration test

- Verifies that an application works with other applications

Acceptance test

- Checks the new system to ensure that it works with actual data

Phase 5: Maintenance

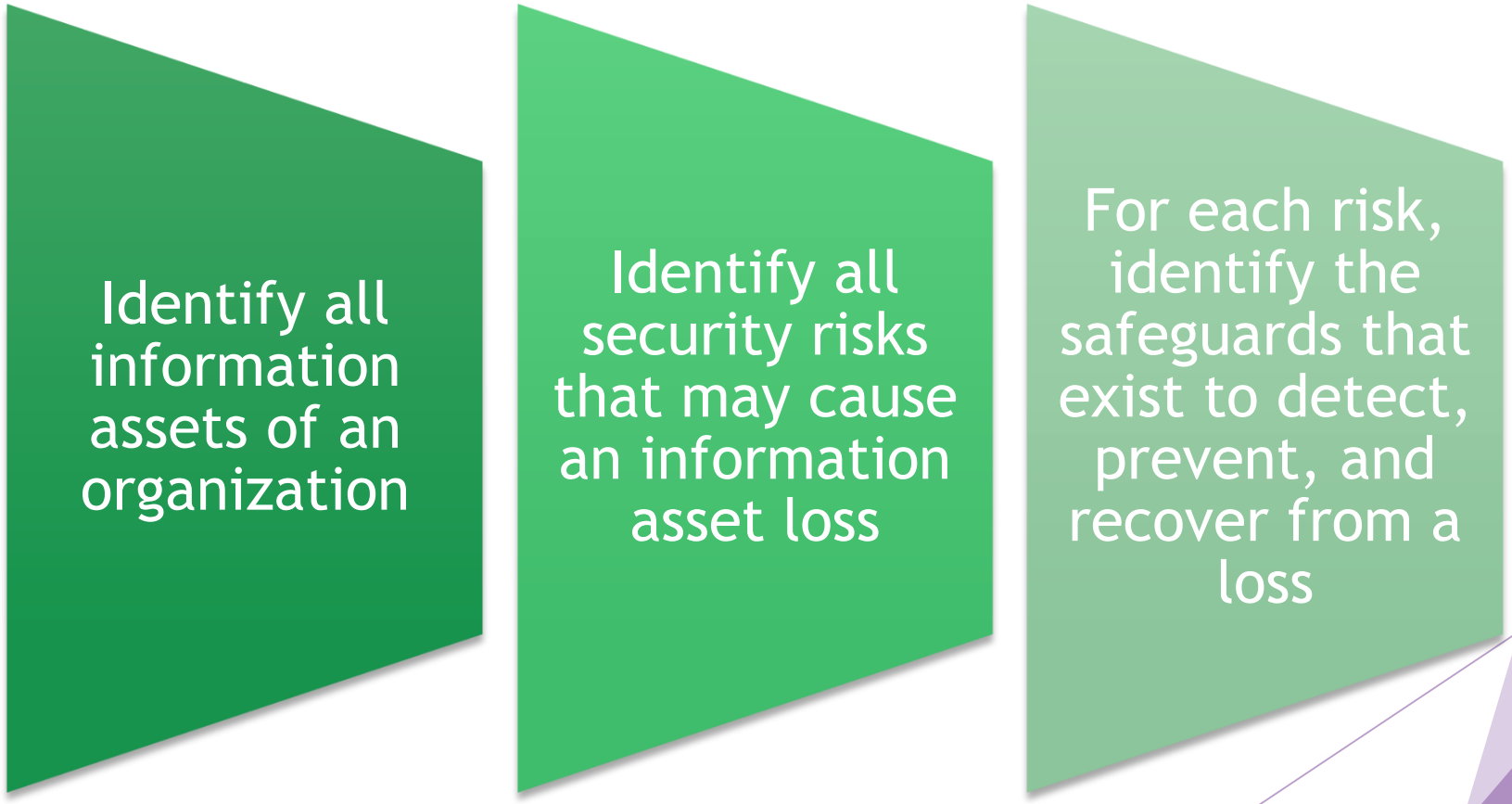
Maintain the system

- Perform periodic evaluations
- Make changes to the system based on new conditions
- Document those changes

maintenance

- operation, support, and security phase
- is to provide ongoing assistance for an information system and its users after the system is implemented

computer security plan



implementation & changeover

- practical issues
- hardware and network infrastructure
- testing of the system
- educate and train staff
- change-over from the old system to the new

- Input: working system, not tested by users
- Output: signed-off, operational information system installed in all locations

implementation & changeover

does the new IS system

- work properly?
- do what the users want?

- transfer data
- fix errors
- higher cost of amendments
  - better to fix earlier!
- may run old system in parallel

review & maintenance

unproductive maintenance

- errors or oversights in original systems development

or,

- the addition of new features and facilities that extend IS scope and functionality

post-implementation review after 6 months

- lessons learnt

issues

lack of communication

- A gap of understanding between users and developers
- Tendency of developers to isolate themselves from users

errors not reported

- Quality measured by closeness of product to specification
  - that’s the design, ‘not my fault’

issues

changes

- Long development times
  - moving goal posts
- Business needs change during the development process
- users not get what they want

solutions

RAD development

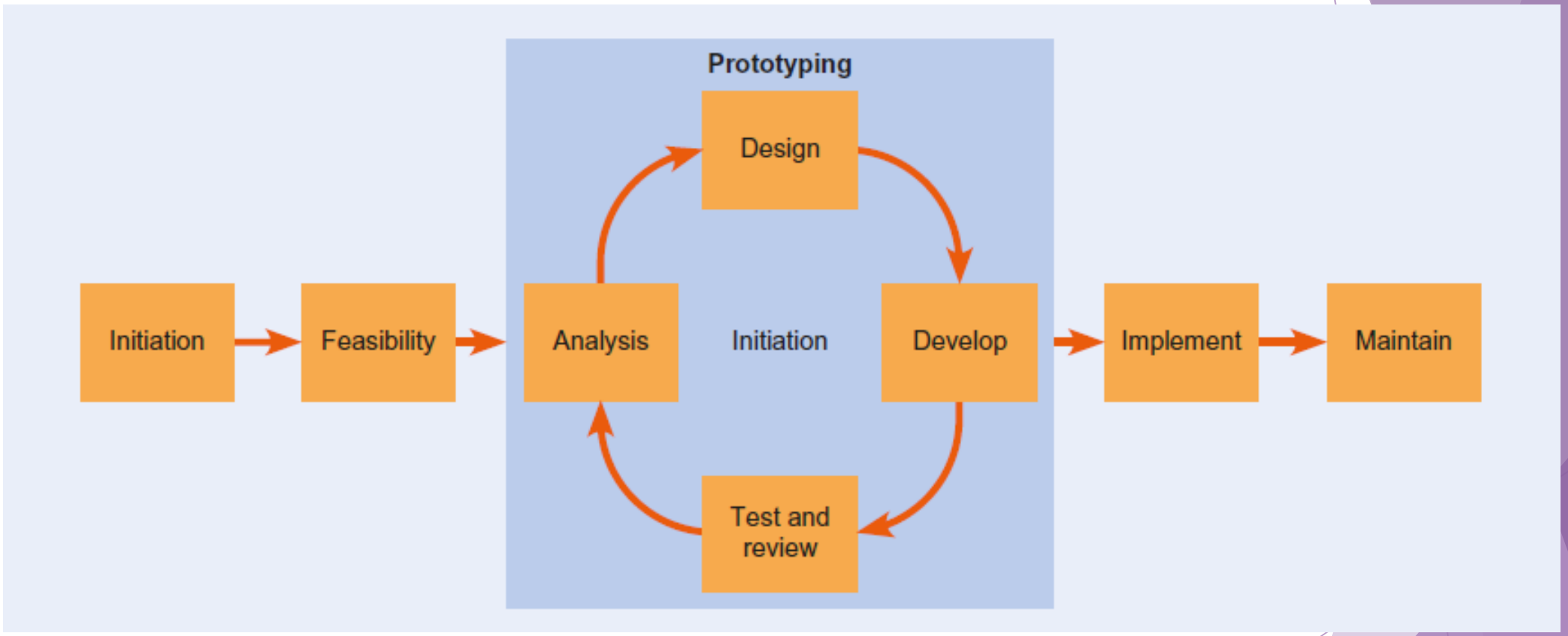
- rapid applications development

user involvement

- at the start
- prototyping
  - allows agreement, understanding and progress

rapid development

- increase in speed
- less changes over time


Prototyping
Design
Initiation
Feasibility
Analysis
Initiation
Develop
Implement
Maintain
Test and review

Thank you!

any questions?