# Managing the development of information systems (Part 1)

(November 12, 2012)



## LEARNING GOALS

- Explain the purpose of systems development methodologies - SDM.
- Describe the major phases of the traditional **S**ystems **D**evelopment **L**ife **C**ycle (SDLC) methodology.



## Systems Development Methodology?

- The process companies go through to *develop* and *maintain* an information system
- Framework for successful IS development
- A System Development Methodology is used
  - For building a new system
  - Or for modifying an existing system
- Examples of SDM:
  - System Development Life Cycle
  - Joint Application Development
  - Prototyping
  - Rapid Application Development

## Questions

- Which of the following is true about SDM?
  a) They provide guidelines for developing IS and maintaining them which includes upgrading and improving them.
  b) SDM are needed when a brand new IS has to be developed, but you don't need to use a SDM when it comes to modifying an existing IS.
  c) When a company is engaged in developing an IS, the process involves the company's employees who would be the potential users of the IS, and IS professionals like system analysts and programmers. But it doesn't involve the company's management
  d) All of the above

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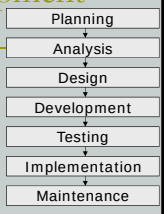
## Traditional Systems Development Life Cycle (SDLC)




- Seven phases
  1) Planning
  2) Systems Analysis
  3) Systems Design
  4) Development
  5) Testing
  6) Implementation
  7) Maintenance
- Typically one phase needs to be completed before beginning the next
- Problem in later phase may require return to previous phase

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## Question

- In SDLC, the 7 phases are typically followed in a sequential order, which means we don't return to a previous phase in any circumstances
  - ❑ True
  - ❑ False

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## Planning

Feasibility Analyses → System Development Schedule

- Feasibility analyses
  - Technical Analysis
    - Do the technologies exist to develop the system?
  - Economic Analysis
    - Can the organization afford the system?
    - Will it provide an adequate Benefit?
  - Operational Analysis (i.e. assessing the human factors that could make the project fail)
    - Resistance to change
    - Organizational politics
- System development schedule
  - Is the proposed development time line realistic?
  - Is the programming team available during Programming step?
- Planning performed by Project Manager using
  - Search and investigation (e.g. for technical analysis step)
  - Total Cost of Ownership analysis
  - Project Management software

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## Systems Analysis

Analyze current system → Define new system requirements

- Systems analyst works with company to fully understand the problem, and to detail the requirements of the proposed system
- Step 1: Analyze current system
  - Objectives:
    - Understand what things are done and how (business processes)
    - Identify any problems associated w/ current business processes
  - Techniques used:
    - Observing employees at work
    - Talking to/interviewing employees (potential users)
    - Conducting interviews

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## Systems Analysis

Analyze current system → Define new system requirements

- Step 2: Define new system's requirements
  - Main Objective:
    - Specify What need to be done (not how to do it)
  - To be defined:
    - **I**nput requirements (nature of data, source, etc.)
    - **P**rocessing requirements
    - **O**utput requirements (Types of reports, content, etc.)
    - Storage requirements
  - Tools and techniques used:
    - Data flow diagrams (DFD)
      - Start with high level process
      - Add more levels with increased levels of detail
    - Computer-Aided Software Engineering (CASE) tools
      - Software that eases the systems development process

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## Questions

- During what SDLC phase software programs like Microsoft Project could be used?
  a) Maintenance
  b) Implementation
  c) Development
  d) System Analysis
  e) Planning
  f) None of the above
- Which of the following tools or techniques could be used during the System Analysis phase of the SDLC? (Choose all correct answers)
  a) Interviews
  b) Observing future users doing their job
  c) Using pseudocode
  d) Using software programs to draw data flow diagrams
  e) All of the above

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## Questions

- What kind of feasibility analysis seeks to determine if an organization can afford the new information system and if the system will provide the adequate benefits?
  a) Operational Feasibility
  b) Financial Feasibility
  c) Economic Feasibility
  d) Beneficial Feasibility
  e) None of the above
- During the *Development* phase of a new medical IS, the development team finds out that most of the technologies needed to develop and implement the system are not yet available on the market. At what step of the SDLC that kind of problem should have been identified?
  a) Maintenance
  b) Implementation
  c) Development
  d) System Analysis
  e) Planning
  f) None of the above

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## Data Flow Diagrams (DFD)

Process

. Symbolized by a rectangle or a curved rectangle.
. Action performed by people of organizational units in order to transform input into output OR Action performed by people in the organizational units to help the units achieve their objectives

Data flow

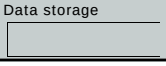


. Symbolized by an arrow.
. Shows data being passed from or to a process

External Entity

Symbolized by a square, an external entity is something (person, group, department, etc.) outside the system that interacts with the system by providing input or receiving information.

Data storage



Used to store data in the system. Represents a file, a database, etc.

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## Exercise 1: DFD

- Use Data Flow Diagram to illustrate your school's registration system. Assume that Students are external entities. Also assume that there are three processes involved in course registration are:
  - Verify Course availability after receiving a course request from a student. This involves checking the Course file
  - Enroll the student in the course after verifying course availability. This involves updating the Student file.
  - Confirm registration. This involves writing an confirmation letter and sending it to the student

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## Exercise 2: DFD

- Do the Lincoln Pizza's ordering system DFD exercise available at:
  - http://www.eiu.edu/~a_illia/BUS3500/DFD-Exercise.htm

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## Systems Design

Logical system design
Physical system design

- Using the requirements from the Systems Analysis phase to design the new or modified system.
  - Logical systems design
    - Details the system's functionality (what it should do?)
    - Uses Structure charts to create top-down representation of system's modules
    - Uses System flowcharts to show relationships between modules
  - Physical systems design
    - Specifies all of the actual components (hardware, network, databases) used to implement the logical design
  - The design must be *frozen* at end of this phase to prevent the to system grow indefinitely in terms of its scope and features
    - Scope creep
    - Feature creep
- Performed by system designer or (system analyst in some case)

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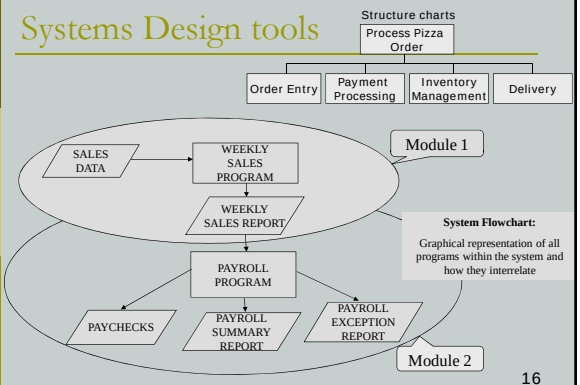
## Systems Design tools

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## Development

- Creating databases
- Writing programs
- Implementing networks components

- Programming is usually the most difficult and time consuming in the Development phase.
- Development performed by programmers, database developers, and network engineers
- Programmers use Program Development Cycle
  1) Review the input, processing, output, and storage requirements
  2) Develop the logic of the programs (using Flowcharts and Pseudo code)
  3) Write the programs using code generators & programming languages
  4) Test and debug the programs
  5) Complete the programs documentation

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## Development tools

**Program Flowchart:**
Graphical illustration of the problem-solving logic within a program


```
Start
Read employee data
Compute gross pay
Compute deductions
Compute net pay
Write employee paycheck
Stop
```

**Pseudocode:**
English-language statements that describe the processing steps of a program in paragraph form.

**Code generators:**
Software that generate programs that programmers could modify.

**Programming languages:**
-Java
-C++
-Visual Basic
-Etc.

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## Questions

- During what phase of the SDLC the *Database* component of a new system is created?
  a) Maintenance
  b) Implementation
  c) Development
  d) System Analysis
  e) Planning
  f) None of the above
- During what phase of the SDLC code generators could be used?
  a) Maintenance
  b) Implementation
  c) Development
  d) System Analysis
  e) Planning
  f) None of the above

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## Testing

- Programmers test modules
  - Do they return proper outputs?
  - Do they handle incorrect data appropriately?
- Development team do *unit testing*
  - i.e. testing how modules work together
- System testing (software along with database and network component)
  - Verification: Testing system in simulated environment with simulated data
  - Validation: Testing system in real working environment with real data

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## Implementation

- Implementation strategies
  - Direct cutover: Quick change to new system
  - Parallel conversion: Old and new systems used in parallel for a while.
  - Pilot testing: New system installed at only one location or one department
  - Staged conversion: Only one part of the system installed, then another part is installed.
- User training

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## Maintenance

- Maintenance counts for as much as ***80%*** of the total cost of an information system
- Tasks
  - Correcting errors found during implementation
  - System enhancements
    - Incremental upgrades
    - Addition of major new features

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## Questions

- The implementation strategy in which the old system is immediately replaced by the new one is called:
  a) Staged conversion
  b) Direct cutover
  c) Systematic testing
  d) None of the above
- Validation testing performed during the Testing phase of the SDLC ensures that the system is working properly in the real working environment using real data.
  a) True
  b) False

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## Problems with Traditional SDLC

- SDLC is time consuming
- SDLC is costly
- SDLC is rather inflexible
- SDLC gets users' inputs **ONLY** during systems analysis and implementation phases

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## Summary Questions

| | Book | Notes |
|---|---|---|
| 1) What is a System Development Methodology? What is it used for? | | |
| 2) What are the 7 phases of the SDLC methodology? | | |
| 3) What kind of Feasibility analyses need to be performed during the Planning phase? Why is the system development schedule important? | | |
| 4) What are the two steps in the Systems Analysis phase? What techniques and tools are used during the Systems Analysis phase? | | |
| 5) What tools do programmers usually use during the Development phase? | | |
| 6) What is the difference between the Verification and the Validation tests performed during systems testing? | | |

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