

# ISYS2110

## Analysis and Design of Web Information Systems

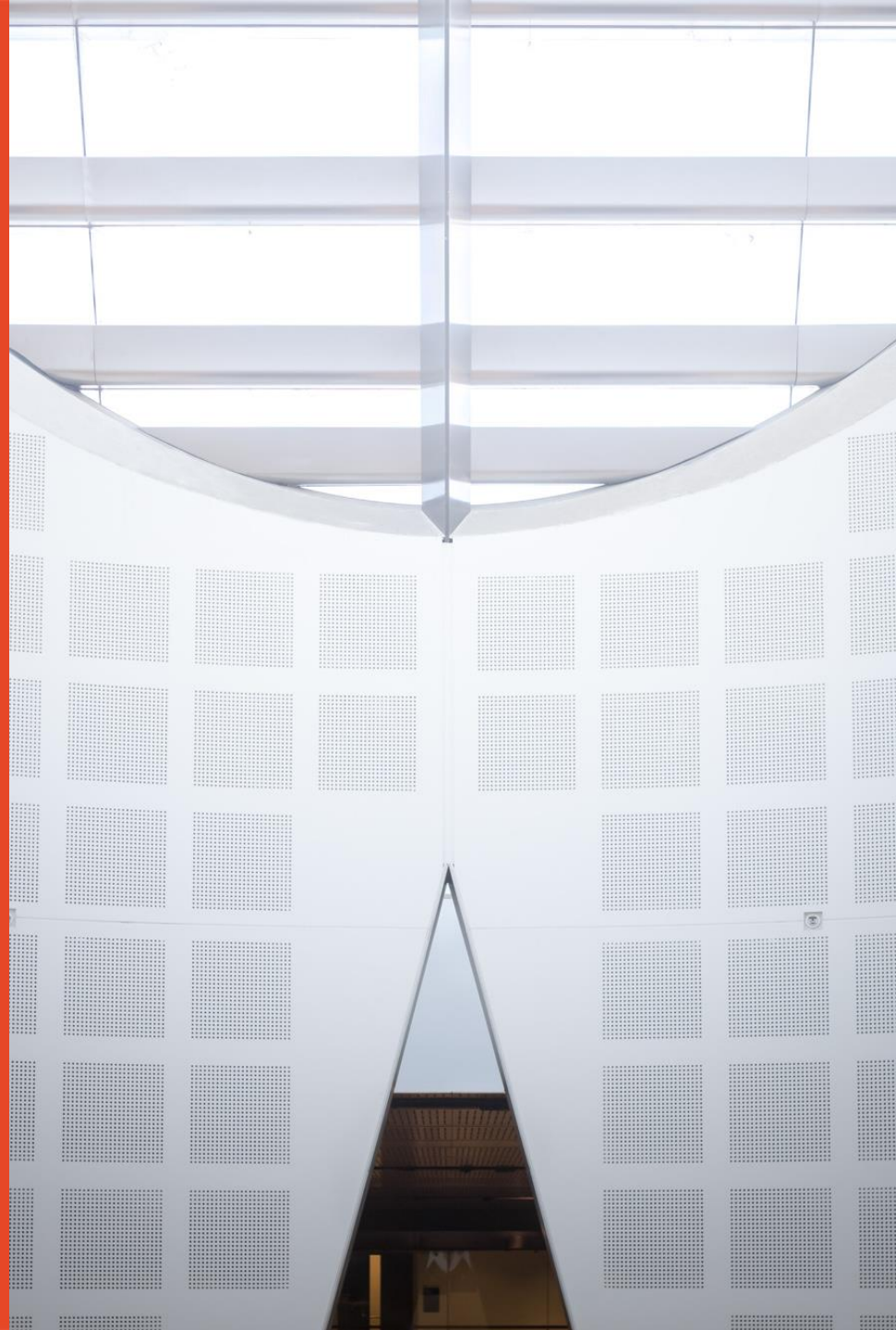
### Lecture 11 Systems Implementation

Semester 1, 2018

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THE UNIVERSITY OF  
**SYDNEY**



# Recapture From Lecture 10

## What we have covered on the topic: **Data Design PART-B and Systems Architecture Design**

- Data Design Part-B (Normalization)
- Issues to consider for a system architecture
- Client/server architecture
- System design specification

# What Will We Do Today ?

- Lecture
  - Implementation
  - Testing
  - Training
- Class activities
  - **Critical Thinking** / No Problem Solving Today
  - <https://padlet.com>
  - <https://answer garden.ch>
- Tutorial: ?
- Assessment ?
- Announcement (if any):

# Learning Objectives

- Discuss the concept of system implementation
- Explain unit, integration, system, and user acceptance testing
- Discuss the main steps in system installation and evaluation
- Develop training plans for various user groups, compare in-house and vendor training options, and describe effective training techniques
- Describe data conversion and changeover methods
- Explain post-implementation evaluation and the final report to management

# Systems Implementation

- **System implementation** is the process of defining how the system would be built to make sure that the system is operational and meets that quality standards.
- System implementation **uses the structure** (developed during systems design) and **the results of system analysis** to build system elements in order to satisfy the stakeholder requirements and system requirements.

# Systems Implementation

## ■ Review the Systems Design

- Tasks involved in creating systems design
  - Break down complex business operations using functional decomposition diagrams (FDDs)
  - Create data flow diagrams (DFDs)
  - Develop an object-oriented model of the new system
- Select a development strategy
- Design the user interface
- Construct entity-relationship diagrams (ERDs)
- Consider an overall system architecture

# Systems Implementation – Software Quality Assurance

- **Software Quality Assurance:** Companies are intensely concerned with the quality of their products and services
  - Objective
    - To avoid problems or to identify them as soon as possible
  - Poor quality can result from:
    - Inaccurate requirements
    - Design problems and coding errors
    - Faulty documentation and ineffective testing

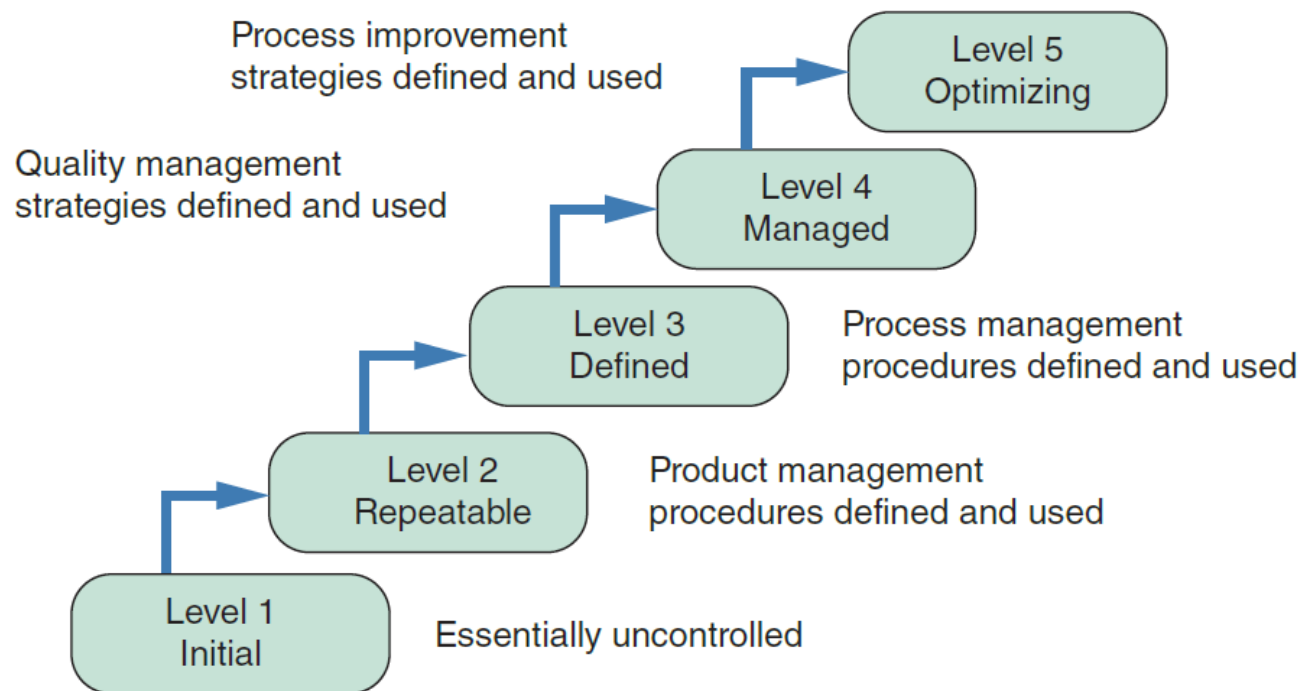
# Systems Implementation – Software Quality Assurance

- Software Engineering Institute (SEI) at Carnegie Mellon University
  - Provides quality standards and suggested procedures for software developers and systems analysts
  - Designed the **Capability Maturity Model (CMM)**, which aims to improve software quality, reduce development time, and cut costs



# Systems Implementation – Software Quality Assurance

- **Capability Maturity Model Integration (CMMI):** Tracks an organization's processes, using five maturity levels



The CMM has five maturity levels, from Level 1 (Initial), which is essentially uncontrolled development, to Level 5 (Optimizing), in which process improvement strategies are defined and used. **source:** Scott Tilley

# Systems Implementation – Software Quality Assurance

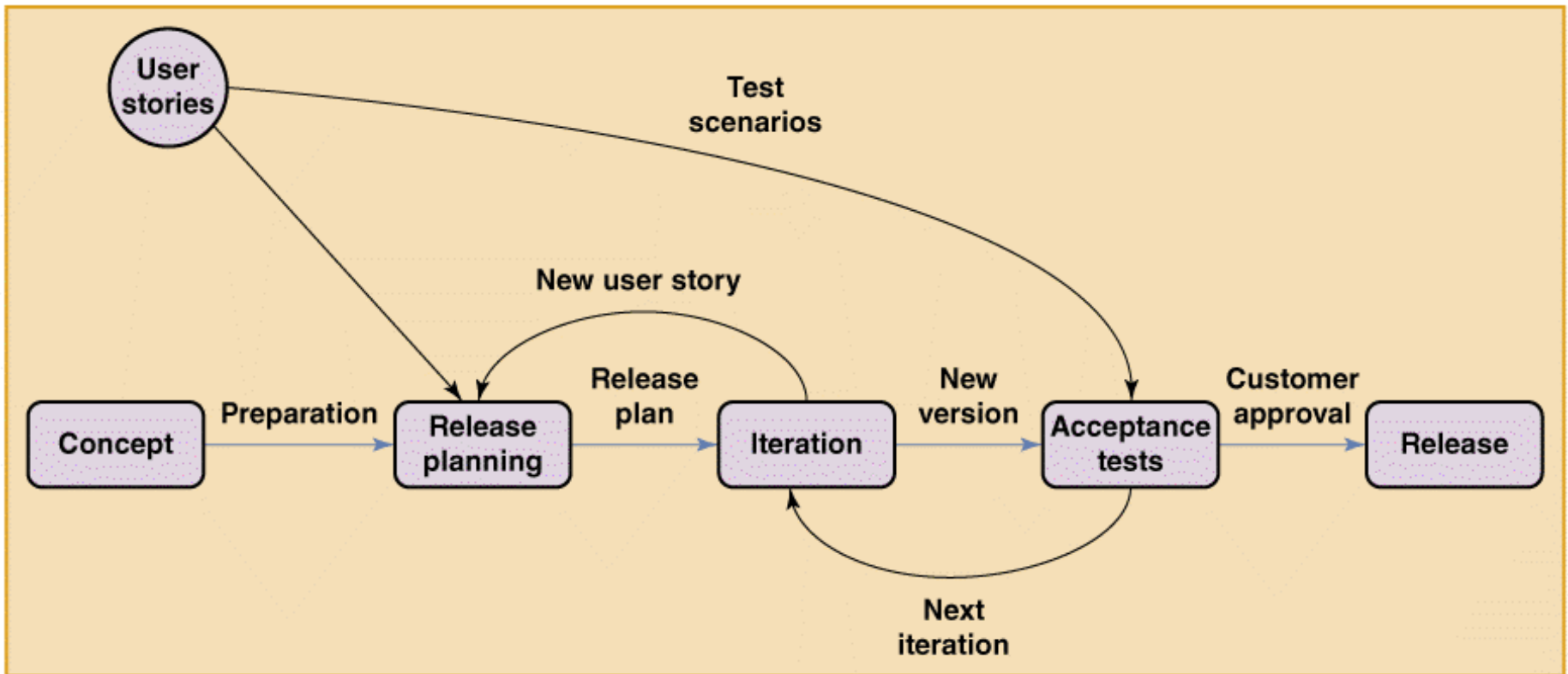
- **International Organization for Standardization (ISO)**
  - Establishes internationally recognized quality standards for products and services
  - **ISO 9000-3:2004**
    - Provides a quality assurance framework for developing and maintaining software
  - ISO standards can be:
    - Specified while purchasing software
    - Used to guide in-house software development efforts

# Systems Implementation

- Application development
  - Process of constructing the programs and code modules that serve as the building blocks of the information system
  - Agile methods
    - Objective – To create a system through an iterative process of planning, designing, coding, and testing

# Systems Implementation

- Application development
  - Agile methods



# Systems Implementation Processes and Techniques

Processes	Techniques	Process Deliverables (Outcomes)
Prepare for System Implementation	Interviews Distribution of Materials Coordination of Training Logistics	<i>Established Team and Environment for System Implementation</i>
Deploy System	Training Sessions Manual Business Operations Parallel Operations	<i>Migrated and Initialized Data Operational System</i>
Transition to Performing Organization	Training Sessions Phased Ownership	<i>Ownership of System by Performing Organization</i>

# Systems Implementation Processes and Techniques

- **Prepare for System Implementation**, where all steps needed in advance of actually deploying the application are performed, including preparation of both the production environment and the Consumer communities.
- **Deploy System**, where the full deployment plan, initially developed during System Design and evolved throughout subsequent lifecycle phases, is executed and validated.
- **Transition to Performing Organization**, where responsibility for and ownership of the application are transitioned from the Project Team to the unit in the Performing Organization that will provide system support and maintenance.

# Systems Implementation Plan

- **Components to be Implemented:** the system is broken down into components.
- **The Implementation Strategy** is a high-level plan of how the system will be implemented. For each component describe aspects of implementation.
- **Data Conversion Strategy:** how legacy data is being handled in terms of overall approach, tools, techniques, sources of data, challenges etc.
- **Deployment Strategy:** addressing the elements needed to deliver the system to identified sites

# Systems Implementation Plan

- **The Testing Strategy** defines, at a high-level, how testing will occur. Testing generally involves periodic deployment to various environments and the involvement of various testing groups
  - Planning how the system will be tested and what hardware/software will be required.
  - The approach to defect-tracking and resolution should be described, including any tools and processes to be used.
  
- **The Knowledge Transfer and Training Strategies** describe the activities that will be undertaken in the critical areas of knowledge transfer (operational team) and training (end users).
  - This plan can be used as the basis of developing a full training schedule later on.



# Testing Concepts

- Testing – the process of examining a component, subsystem, or system to determine its operational characteristics and whether it contains any defects

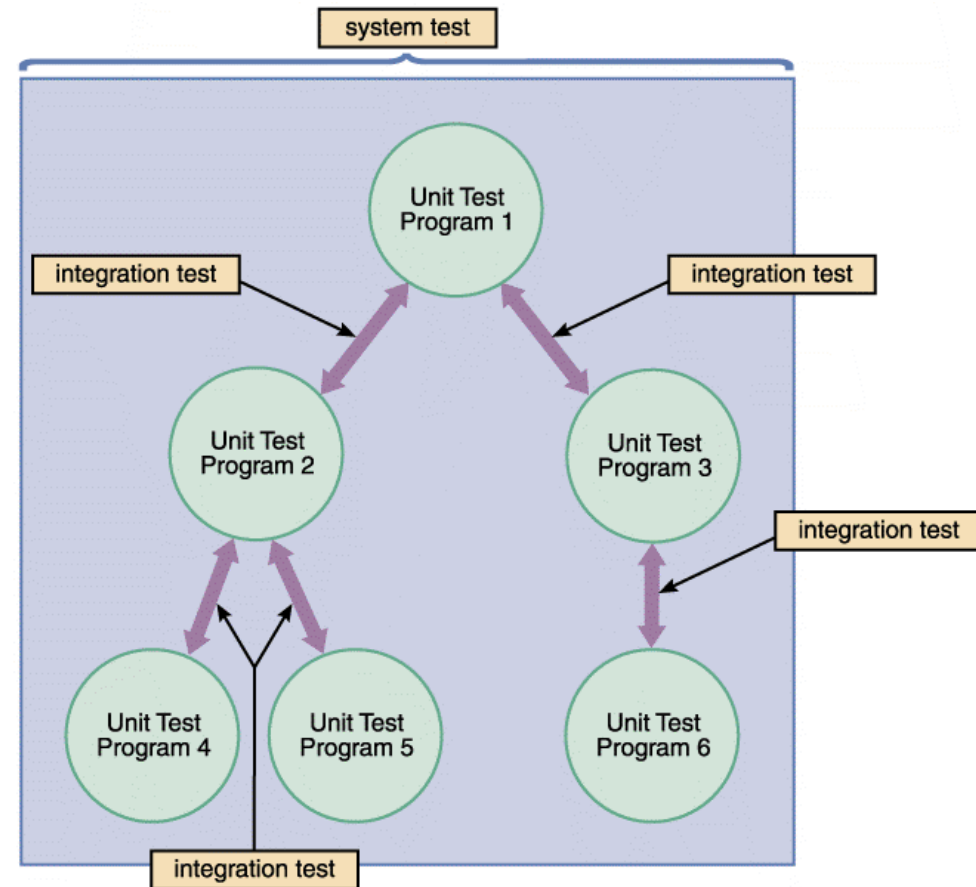
# Common Types of Tests

- Unit Testing
- Integration Testing
- System Testing
- User Acceptance Testing

# Testing Concepts

## ■ Unit Testing

- Testing of an individual program or module
- Aims to identify and eliminate:
  - Execution errors
  - Logic errors
- **Test data** should contain both accurate and erroneous data



The first step in testing is unit testing, followed by integration testing, system testing, and user acceptance testing.

# Testing Concepts

- **Stub testing** is required
  - The programmer:
    - Simulates each program outcome or result
    - Displays a message to indicate whether the program has executed successfully
  - A **test plan** is created during the systems design phase
    - Contains details regarding testing procedures

# Testing Concepts

- **Integration Testing**

- Testing two or more programs that depend on each other to make sure that the programs work together properly

# Testing Concepts

## ■ Integration Testing Procedures

- Build and unit test the components to be integrated
- Create test data – comprehensive test data, must be coordinated between developers
- Conduct the integration test – Assign resources and responsibilities. Plan frequency and procedures
- Evaluate the test results – Identify valid and invalid responses
- Log the test results – Log valid test runs. Also log errors
- Correct the code and retest

# Testing Concepts

## ■ System Testing

- an integration test of an entire system or independent subsystem
- Objectives
  - Verify that the system will handle all data properly
  - Ensure that the IT staff has the documentation and instructions needed to operate the system properly
  - Verify that all system components are integrated properly
  - Confirm that the information system can handle predicted volumes of data in a timely and efficient manner

# Testing Concepts

- System testing also involves performance test (an integration and usability test that determines whether a system or subsystem can meet time-based performance criteria)
  - Response time – the desired or maximum allowable time limit for software response to a query or update
  - Throughput – the desired or minimum number of queries and transactions that must be processed per minute or hour
  - Business functions
  - Stability
  - Resource Usage
  - Speed



# Testing Concepts

## ■ User Acceptance Testing

- a system test performed to determine whether the system fulfills user requirements
- May be performed near the end of the project
- A very formal activity in most development projects.  
Payments tied to passing this tests

# Testing Concepts

- Preparation and Pre-UAT Activities
  - Develop test data – data entry and database records
  - Plan and schedule specific tests
  - Set up test environment
  
- Manage and execute the UAT
  - Much like a mini-project
  - Assign responsibilities
  - Document and track results (especially errors and fixes)
  - Rework the plan for re-testing as required

# Management Approval

- After user acceptance testing is complete, the results are presented to the management
  - Test results should be described
  - Status of all required documentation should be updated
  - Input from users who participated in system testing should be summarized
  - Detailed time schedules, cost estimates, and staffing requirements for making the system fully operational should be provided

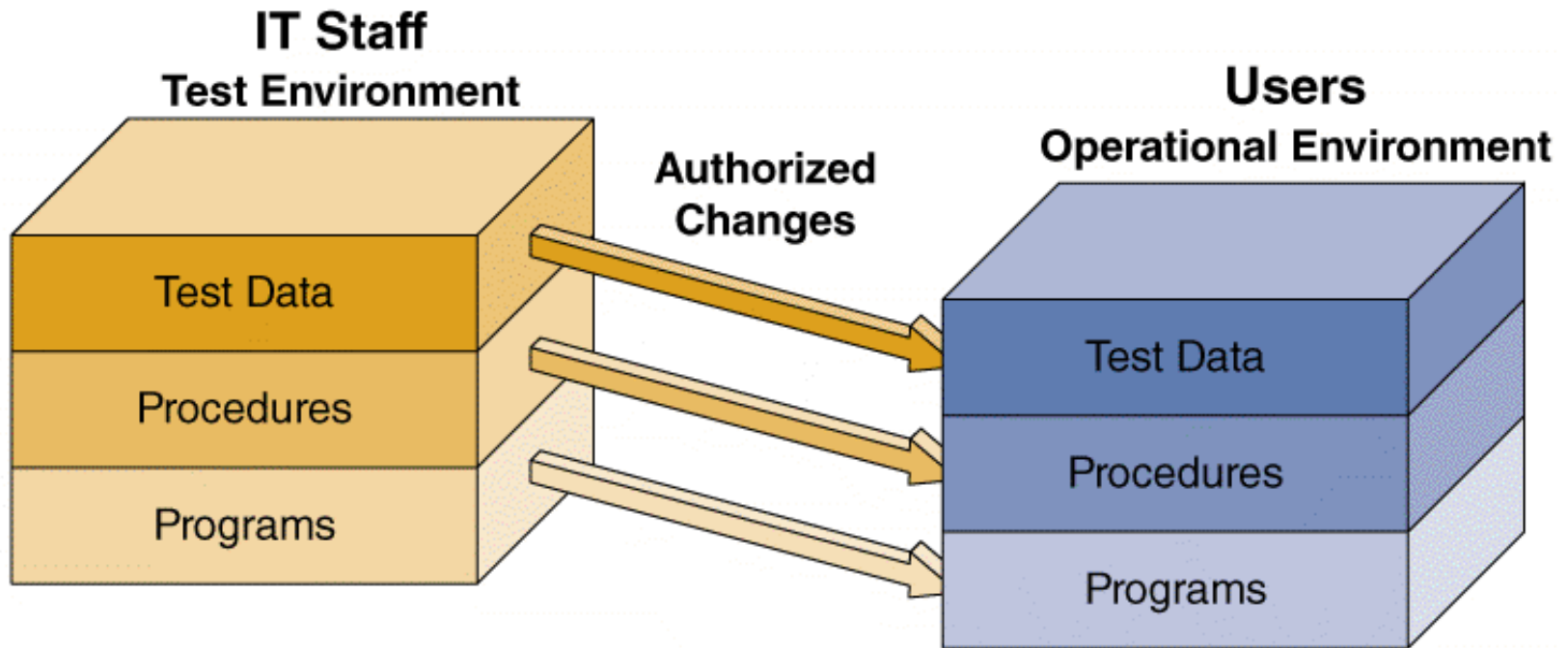
# System Installation and Evaluation

- Prepare a separate operational and test environment
- Provide training for users, managers, and IT staff
- Perform data conversion and system changeover
- Carry out a post-implementation evaluation of the system
- Present a final report to management

# Operational and Test Environments

- **Operational or production environment**
  - Environment for the actual system operation
- **Test environment**
  - Environment that analysts and programmers use to develop and maintain programs
  - A separate test environment is necessary to maintain system security and integrity and protect the operational environment

# Operational and Test Environments (Cont.)



The test environment versus the operational environment. Notice that access to the test environment is limited to IT staff, while the operational environment is restricted to users.

# Class Exercise

- Q1: Can users be allowed to access test environment?
- Q2: Can IT staff be allowed to access operational environment? Explain

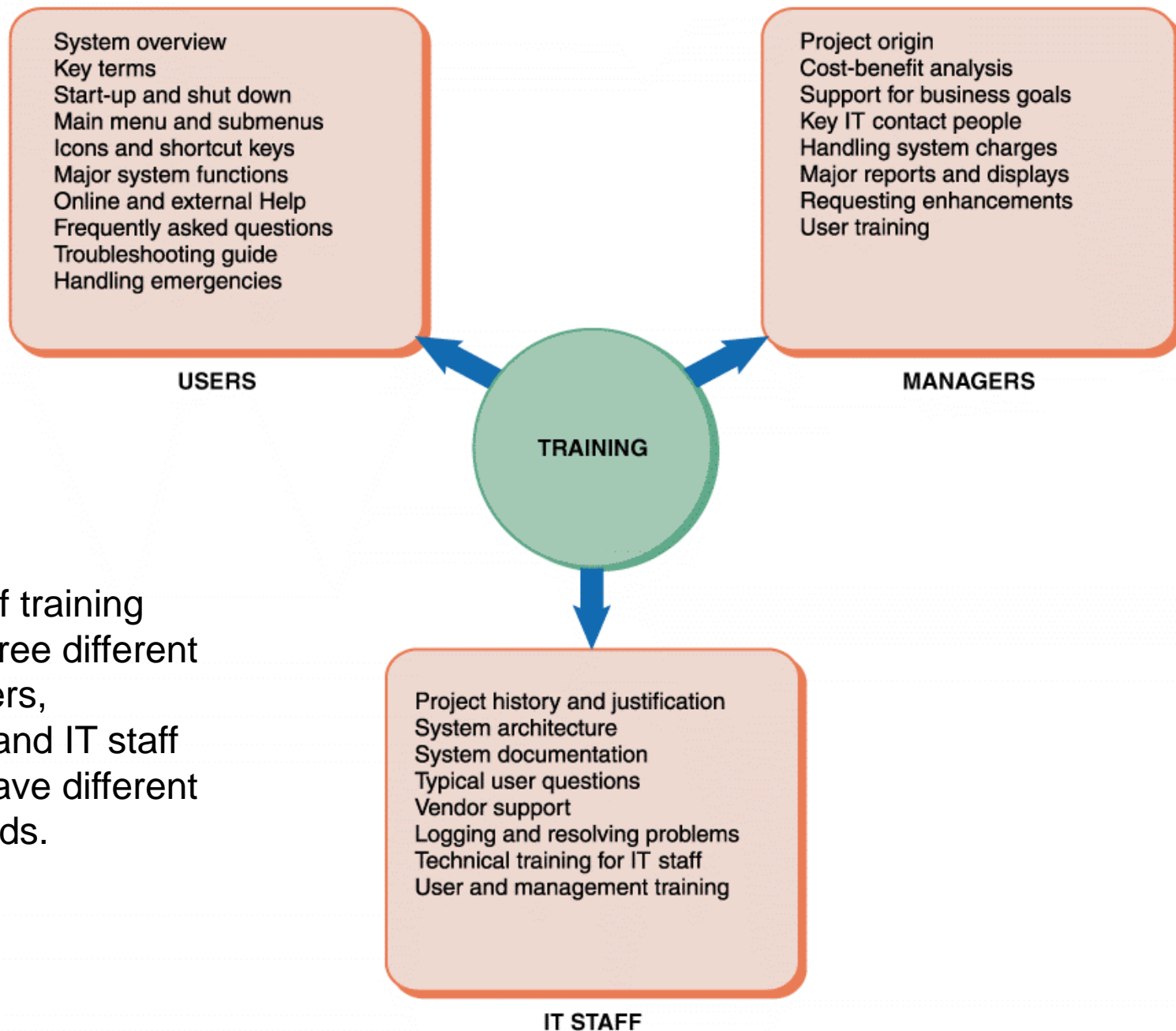
# Training

## ■ Training Plan

- Identify who should receive training and what training is required
  - Organization should be observed carefully to determine how the system will support business operations, and who will be involved or affected
- Main groups for training
  - Users
  - Managers
  - IT staff



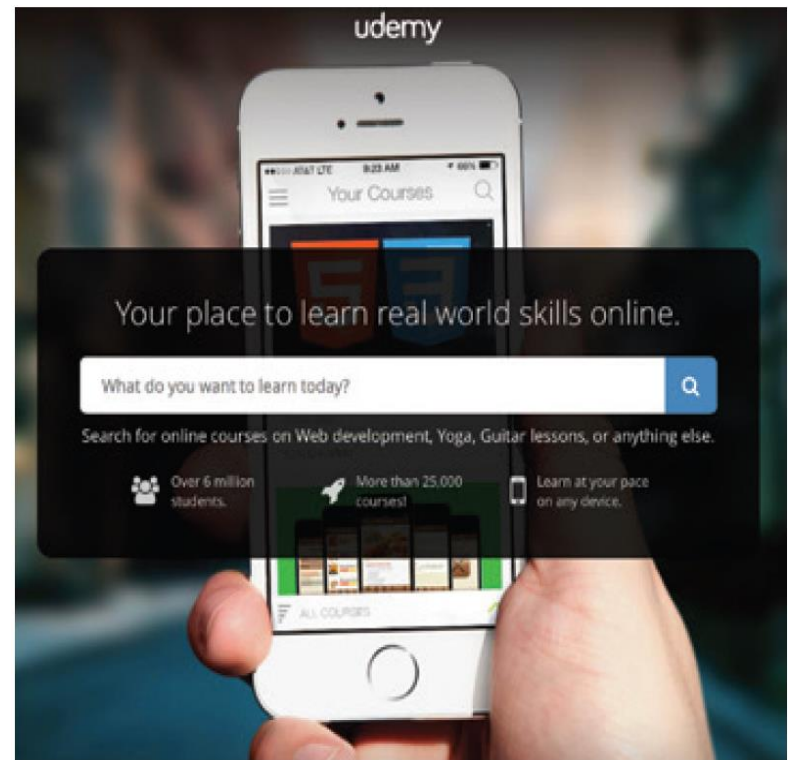
# Training



Examples of training topics for three different groups. Users, managers, and IT staff members have different training needs.

# Training (Cont. 2)

- **Training provided by vendor**
  - Required if the system includes the purchase of hardware or software
    - Scope is limited to a standard version of the vendor's software or hardware
- **Webinars, Podcasts, and Tutorials**
  - Web-based training options
- **Outside Training**
  - Viable alternative if vendor training is not practical



Udemy is one of many sources of online training.

Source: Udemy.com

# Training (Cont. 3)

## ■ Training Tips

- Train people in groups, with separate training programs for distinct groups
- Select the most effective place to conduct the training
- Provide for learning by hearing, seeing, and doing
- Rely on previous trainees

## ■ Interactive Training

- Effective training is interactive, self-paced, and multimedia-based

# Training (Cont. 4)

- Online training
  - Effective when it is more realistic
  - Sophisticated training systems offer interactive sessions
  - Training material should include a reference section that summarizes all options and commands, lists all possible error messages, and what actions the user should take when a problem arises
  - A full-scale test, or **simulation** must be conducted after the training is complete

# Data Conversion

- **Data Conversion** is a process in which existing data is loaded on to a new system
- Data Conversion Strategies
  - Automate the data conversion process if possible
  - Old systems may be able to export data in ASCII (American Standard Code for Information Interchange) or ODBC (Open Database Connectivity) formats
  - If a standard format is not available, develop a program to extract the data and convert it to an acceptable format

# Data Conversion (Cont.)

## ■ Data Conversion Security and Controls

- Maintain strict input controls during the conversion process
- Ensure that all system control measures are in place and operational to protect data from unauthorized access and to help prevent erroneous input
- Ensure that error-free data is fed into the new system

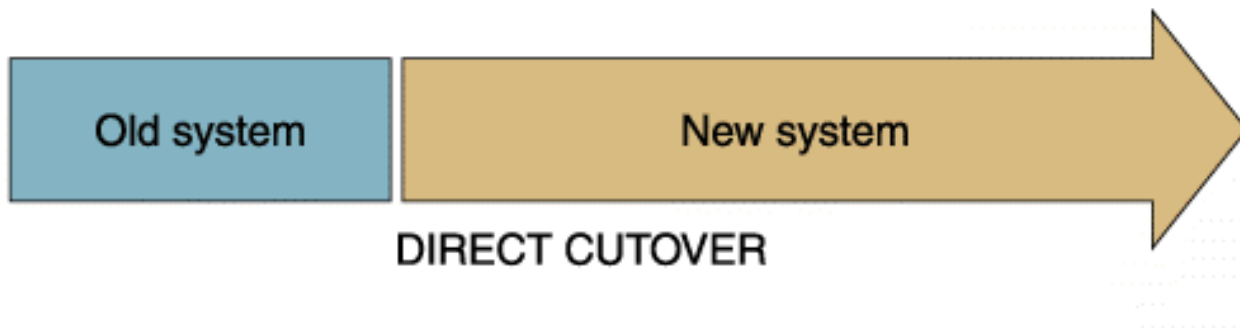
# System Changeover

- Process of putting the new information system online and retiring the old system
- Can be rapid or slow, depending on the method
- Types
  - Direct cutover
  - Parallel operation
  - Pilot operation
  - Phased operation

# System Changeover (Cont. 1)

## ■ Direct Cutover

- Enables changeover when the new system becomes operational
- Least expensive changeover method
  - IT group has to operate and maintain only one system at a time

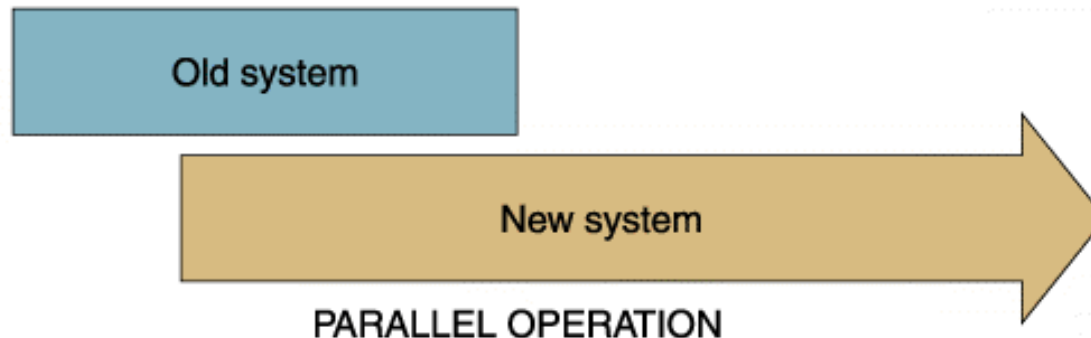




# System Changeover (Cont. 2)

## ■ Parallel Operation

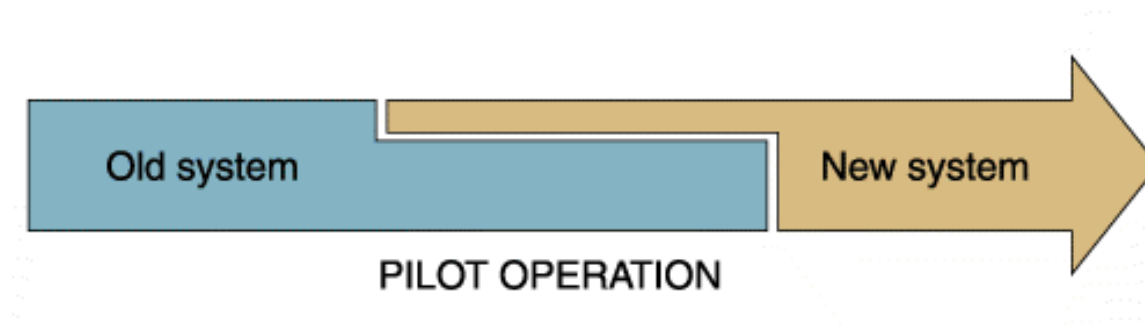
- Both the old and the new information systems operate fully for a specified period
- Advantage - Lower level of risk
  - The old system can be used as a backup
- Not practical if the old and new systems are incompatible



# System Changeover (Cont. 3)

## ■ Pilot Operation

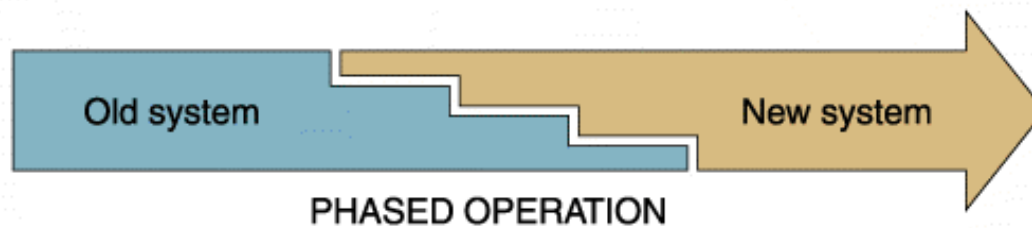
- Implements the complete new system at a selected location of the company
- **Pilot site:** Group that uses the new system first
- Reduces the risk of system failure
- Less expensive than a parallel operation



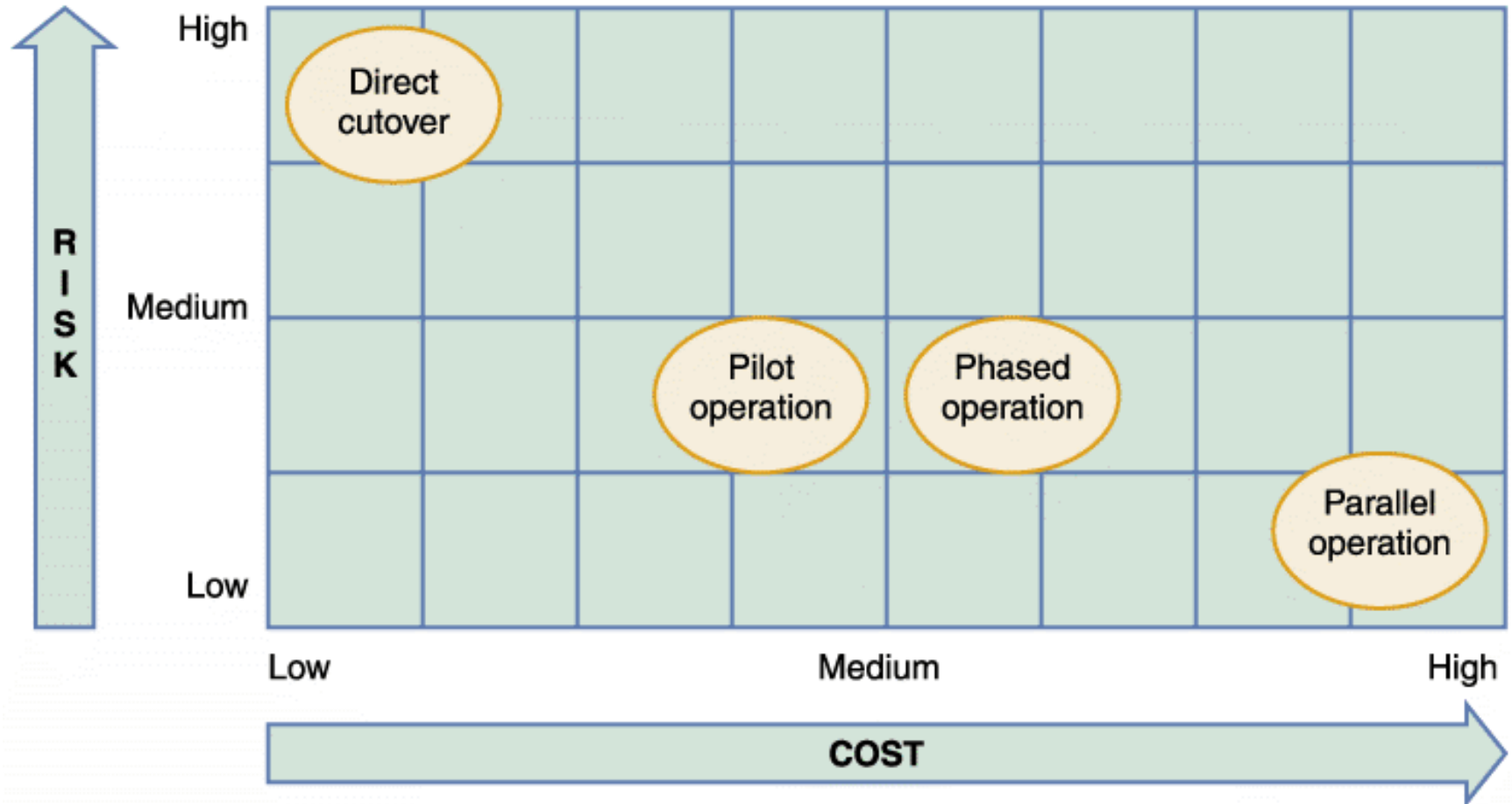
# System Changeover (Cont. 4)

## ■ Phased Operation

- Implements the new system in stages, or modules
- Combines direct cutover and parallel operation to reduce risks and costs
  - Only a part of the system is given to all users
- Risk of errors or failures is limited to the implemented module only
- Less expensive than full parallel operation



## System Changeover (Cont. 5)



Relative risk and cost characteristics of the four changeover methods.

# Class Exercise

- Q1: Which type of systems changeover would you use for your current group project?
  - Share your answer at answergarden
  - <https://answergarden.ch/>
  
- Q2: What are the criteria/questions that would you use to decide on the type of systems changeover ?
  - Share your answer at answergarden
  - <https://answergarden.ch/>

# Post Implementation Tasks

## ■ **Post-Implementation Evaluation**

- Assesses the overall quality of the information system
- Includes feedback for the following areas:
  - Accuracy, completeness, timeliness of information system output, and user satisfaction
  - System reliability and maintainability
  - Adequacy of system controls and security measures
  - Hardware efficiency and platform performance
  - Effectiveness of database implementation
  - Performance of the IT team
  - Completeness and quality of documentation
  - Quality and effectiveness of training
  - Accuracy of cost-benefit estimates and development schedules

# Post Implementation Tasks (Cont. 1)

- Guidelines of evaluating a system:
  - Interview members of management and key users
  - Observe users and computer operations personnel actually working with the new information system
  - Read all documentation and training materials
  - Examine all source documents, output reports, and screen displays
  - Use questionnaires to gather information and opinions from a large number of users
  - Analyze maintenance and help desk logs

# Post Implementation Tasks (Cont. 2)

Sample user evaluation form. The numerical scale allows easy tabulation of results.

Following this section, the form provides space for open-ended comments and suggestions.

**User Evaluation Form**

System: \_\_\_\_\_ Evaluator: \_\_\_\_\_ Date: \_\_\_\_\_

Please evaluate the information system project by circling the one number for each factor that best represents your assessment.

	1	2	3	4	5	6
<b>SYSTEM OUTPUT</b>						
1. Accuracy of information .....	1	2	3	4	5	6
2. Completeness of information .....	1	2	3	4	5	6
3. Ease of use .....	1	2	3	4	5	6
4. Timeliness of information .....	1	2	3	4	5	6
<b>USER INTERFACE</b>						
5. Clarity of instructions .....	1	2	3	4	5	6
6. Quality of Help messages .....	1	2	3	4	5	6
7. Ease of use .....	1	2	3	4	5	6
8. Appropriateness of options .....	1	2	3	4	5	6
9. Clarity of error messages .....	1	2	3	4	5	6
10. Prevention of input errors .....	1	2	3	4	5	6
<b>INFORMATION TECHNOLOGY STAFF</b>						
11. Cooperation .....	1	2	3	4	5	6
12. Availability .....	1	2	3	4	5	6
13. Knowledge .....	1	2	3	4	5	6
14. Reporting of progress .....	1	2	3	4	5	6
15. Communication skills .....	1	2	3	4	5	6
<b>TRAINING</b>						
16. Completeness .....	1	2	3	4	5	6
17. Appropriateness .....	1	2	3	4	5	6
18. Schedule .....	1	2	3	4	5	6



# Post Implementation Tasks (Cont. 3)

## ■ Final Report to Management

- Submitted at the end of the SDLC phase
- Includes:
  - Final versions of all system documentation
  - Planned modifications and enhancements to the system that have been identified
  - Recap of all systems development costs and schedules
  - Comparison of actual costs and schedules to the original estimates
  - Post-implementation evaluation, if it has been performed

## Class Exercise – critical thinking

- Q1: What is the main difference between System Implementation and all other phases of the lifecycle ?

## Class Exercise – critical thinking

- Q2: Does the system need to be perfect before deployment ?

# System Implementation Plan Template

- Uploaded on Canvas (week 11)

## (1) IMPLEMENTATION STRATEGY

Component Name	Description of Function	Source	Implementation Strategy
	A brief description of what the components does		The implementation strategy should explain <ul style="list-style-type: none"> <li>• Implementation environment and facilities;</li> <li>• Methods and tools;</li> <li>• Deliverables for the user community, including training; Identification of deployment sites etc.</li> </ul>
Application			
		Developed In House, Custom Developed by a Contractor, Off the Shelf, etc...	
Module			

## (2) DATA CONVERSION STRATEGY

For the conversion strategy you should briefly describe (in 1-2 paragraph/s) how legacy data will be handled. You may choose to describe the overall approach of data conversion, tools and techniques to use, sources of data, challenges, etc..

## (3) TESTING STRATEGY

Type of Test	Description	Frequency
Unit Testing	Based on your project, describe method, tools, people involved, effort, etc...	Every X days/months, before major releases, etc...
Integration Testing		
System Testing		
User Acceptance Testing		
Other Tests (if any)		

## (4) KNOWLEDGE TRANSFER STRATEGY

Transfer Activity	Audience	Person Responsible	Timeframe
Produce Operations Manual	Who, on the operational team, is this activity intended for?	Who, on the implementation team, is responsible for this activity?	Dates, times, frequency, etc...
Conduct Workshop/ Training			

# Lecture Summary

- Systems implementation phase consists of implementation strategy, testing, installation, and evaluation of the new system
- Programmers perform code review, and unit testing tasks during application development
- During the installation process, an operational environment for the new information system is established separate from the test environment

# Lecture Summary

- Everyone who interacts with the new information system should receive training appropriate to their skills
- Data conversion often is necessary when installing a new information system
- System changeover is the process of putting the new system into operation

# Lecture Summary

- A post-implementation evaluation assesses and reports on the quality of the new system and the work done by the project team
- The final report to management includes the final system documentation, describes any future system enhancements that already have been identified, and details the project costs

**Announcement (if any)**

Q &A?

Thanks everyone !