

Systems Analysis

Determining requirements

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... การจะพัฒนาทุกสิ่งทุกอย่างให้เจริญนั้น จะต้องสร้างและเสริมขึ้นจาก
พื้นฐานเดิมที่มีอยู่ก่อนทั้งสิ้น ถ้าพื้นฐานไม่ดีหรือคลอนแคลน
บกพร่องแล้ว ที่จะเพิ่มเติมเสริมต่อให้เจริญขึ้นไปอีกนั้น ยากนักที่จะ
ทำได้ จึงควรจะเข้าใจให้แจ่มชัดว่า นอกจากจะมุ่งสร้างความเจริญ
แล้ว ยังต้องพยายามรักษาพื้นฐานให้มั่นคง ไม่บกพร่องพร้อมๆกันไป
ด้วย ...

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topics

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- Systems analysis phase activities
- Team-oriented strategies
- Modeling tools
- System Requirements Checklist
- Fact-finding techniques



Systems analysis phase activities

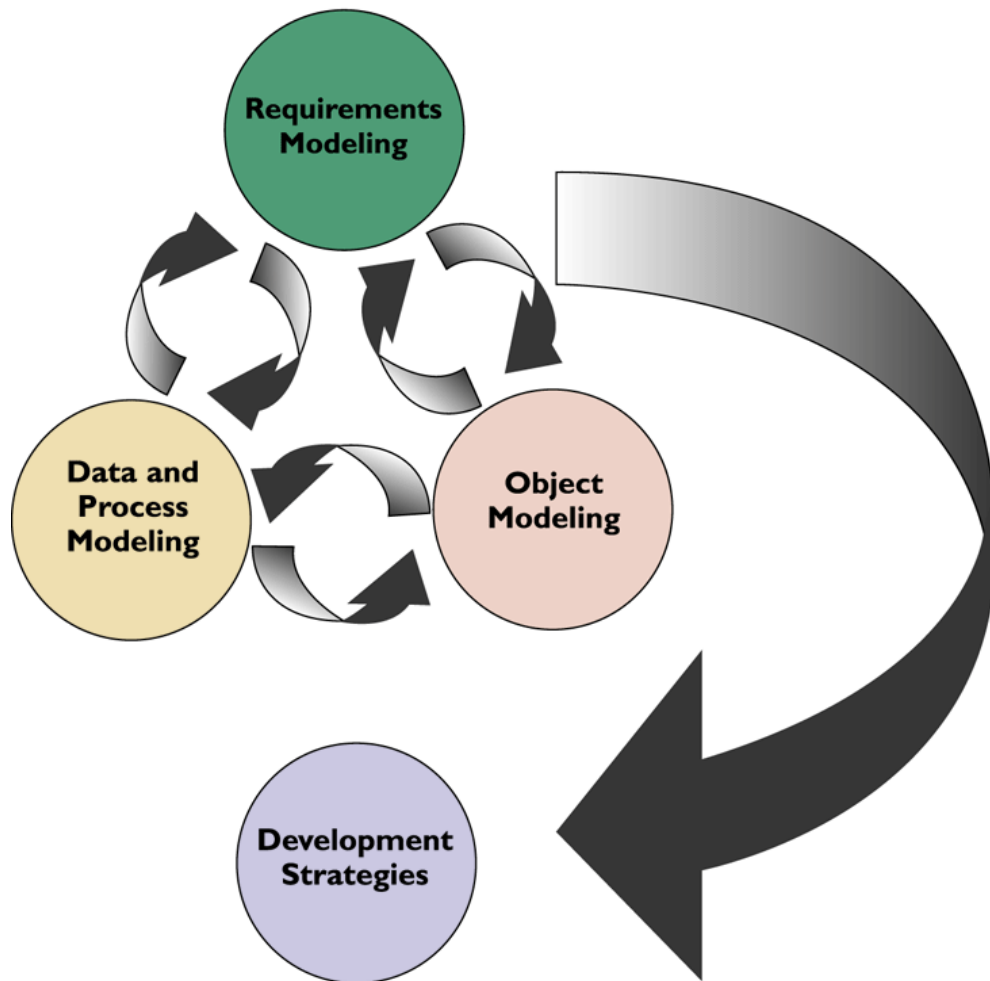
Systems Analysis Phase Activities

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- The overall objective of the systems analysis phase is
 - ▣ to understand the proposed project,
 - ▣ ensure that it will support business requirements, and
 - ▣ build a solid foundation for system development
- use models and other documentation tools to visualize and describe the proposed system

Overview: Systems Analysis Phase


Systems Analysis Phase Tasks



- Although the waterfall model shows sequential SDLC phases, it is not uncommon for several phases (or certain tasks within a phase) to interact during the development process, just as they would in an adaptive model.

REQUIREMENTS MODELING

- involves fact-finding to describe the current system and identification of the requirements for the new system, such as outputs, inputs, processes, performance, and security.
- **Outputs** refer to electronic or printed information produced by the system.
- **Inputs** refer to necessary data that enters the system, either manually or in an automated manner.

- 
- **Processes** refer to the logical rules that are applied to transform the data into meaningful information.
 - **Performance** refers to system characteristics such as speed, volume, capacity, availability, and reliability.
 - **Security** refers to hardware, software, and procedural controls that safeguard and protect the system and its data from internal or external threats.

DATA AND PROCESS MODELING

- continue the modeling process by learning how to represent graphically system data and processes using traditional structured analysis techniques.,
- structured analysis identifies the data flowing into a process, the business rules that transform the data, and the resulting output data flow

OBJECT MODELING

- another popular modeling technique.
- While structured analysis treats processes and data as separate components, object-oriented analysis (O-O) combines data and the processes that act on the data into things called objects.
- These objects represent actual people, things, transactions, and events that affect the system



Team-oriented strategies

DEVELOPMENT STRATEGIES





- Consider various development options and prepare for the transition to the systems design phase of the SDLC.

Systems Analysis Skills

need strong analytical and interpersonal skills to build an accurate model of the new system.

- ▣ **Analytical skills** enable you to identify a problem, evaluate the key elements, and develop a useful solution.
- ▣ **Interpersonal skills** are especially valuable to a systems analyst who must work with people at all organizational levels, balance conflicting needs of users, and communicate effectively

- 
- Because information systems affect people throughout the company, you should consider team-oriented strategies as you begin the systems analysis phase
 - ▣ Joint application development (JAD)
 - ▣ Rapid application development (RAD)
 - ▣ Agile methods

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- The IT department's goal is to deliver the best possible information system, at the lowest possible cost, in the shortest possible time.
 - To achieve the best results, system developers view users as partners in the development process.
 - Greater user involvement usually results in better communication, faster development times, and more satisfied users.

Joint Application Development (JAD)

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- Popular fact-finding technique that brings users into the development process as active participants
- is a user-oriented technique for fact-finding and requirements modeling.
- Because it is not linked to a specific development methodology, systems developers use JAD whenever group input and interaction are desired

JAD

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- User Involvement
 - ▣ Users have a vital stake in an information system and they should participate fully
 - ▣ Successful systems must be user-oriented, and users need to be involved
 - ▣ One popular strategy for user involvement is a JAD team approach

JAD Participants and Roles

- A JAD team usually meets over a period of days or weeks in a special conference room or at an off-site location.
- Either way, JAD participants should be insulated from the distraction of day-to-day operations.
- The objective is to analyze the existing system, obtain user input and expectations, and document user requirements for the new system

JAD

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■ JAD Participants and Roles

JAD PARTICIPANT	ROLE
JAD project leader	Develops an agenda, acts as a facilitator, and leads the JAD session
Top management	Provides enterprise-level authorization and support for the project
Managers	Provide department-level support for the project and understanding of how the project must support business functions and requirements
Users	Provide operational-level input on current operations, desired changes, input and output requirements, user interface issues, and how the project will support day-to-day tasks
Systems analysts and other IT staff members	Provide technical assistance and resources for JAD team members on issues such as security, backup, hardware, software, and network capability
Recorder	Documents results of JAD sessions and works with systems analysts to build system models and develop CASE tool documentation

JAD

- Typical agenda for JAD session

Project leader	<ul style="list-style-type: none">• Introduce all JAD team members• Discuss ground rules, goals, and objectives for the JAD sessions• Explain methods of documentation and use of CASE tools, if any
Top management (sometimes called the project owner or sponsor)	<ul style="list-style-type: none">• Explain the reason for the project and express top management authorization and support
Project leader	<ul style="list-style-type: none">• Provide overview of the current system and proposed project scope and constraints• Present outline of specific topics and issues to be investigated
Open discussion session, moderated by project leader	<ul style="list-style-type: none">• Review the main business processes, tasks, user roles, input, and output• Identify specific areas of agreement or disagreement• Break team into smaller groups to study specific issues and assign group leaders

JAD

■ Typical agenda for JAD session

JAD team members working in smaller group sessions, supported by IT staff	<ul style="list-style-type: none">• Discuss and document all system requirements• Develop models and prototypes
Group leaders	<ul style="list-style-type: none">• Report on results and assigned tasks and topics• Present issues that should be addressed by the overall JAD team
Open discussion session, moderated by project leader	<ul style="list-style-type: none">• Review reports from small group sessions• Reach consensus on main issues• Document all topics
Project leader	<ul style="list-style-type: none">• Present overall recap of JAD session• Prepare report that will be sent to JAD team members

JAD

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Advantages and Disadvantages

- More expensive and can be cumbersome if the group is too large relative to the size of the project
- Allows key users to participate effectively
- When properly used, JAD can result in a more accurate statement of system requirements, a better understanding of common goals, and a stronger commitment to the success of the new system

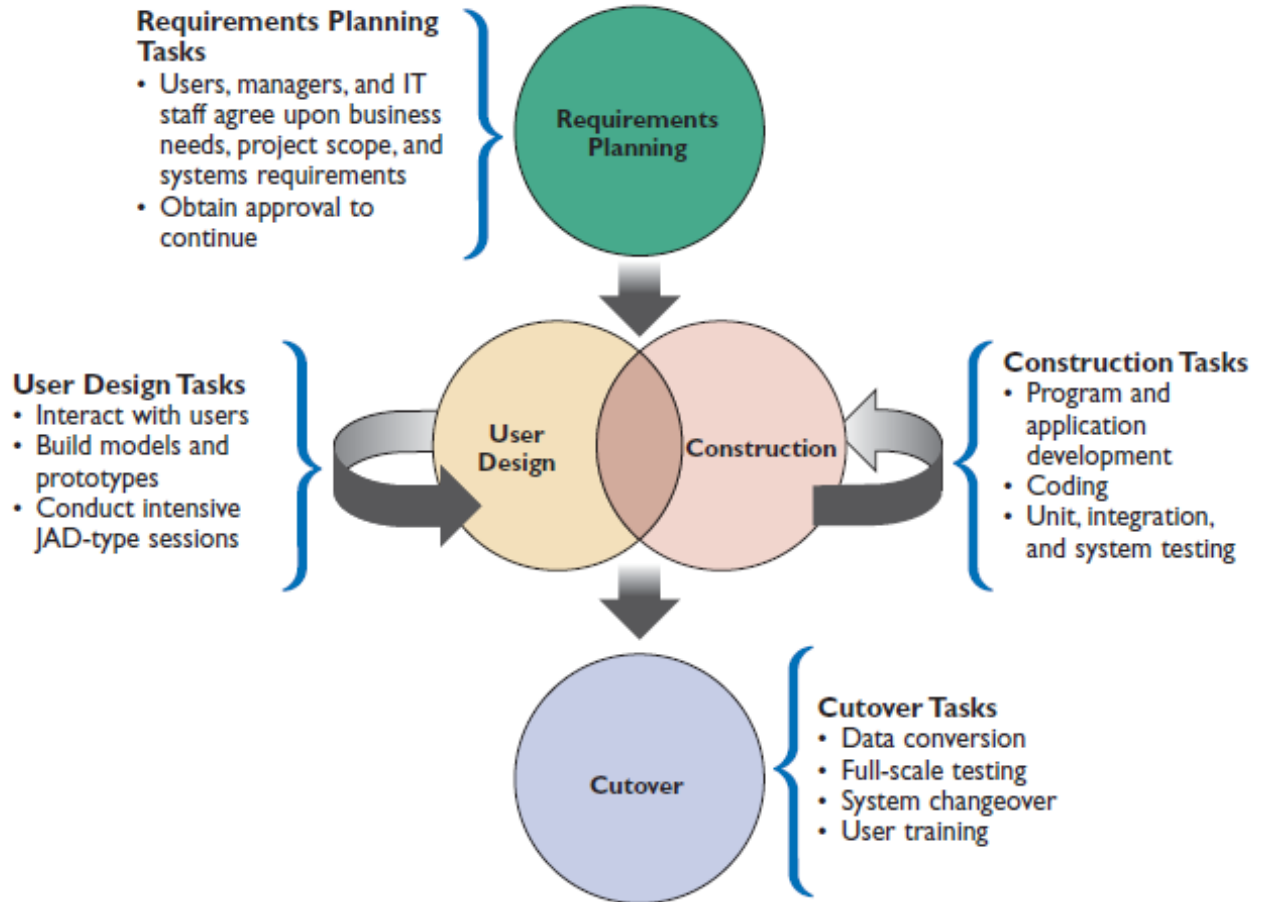
Rapid Application Development (RAD)

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- Is a team-based technique that speeds up information systems development and produces a functioning information system
- Like JAD but goes much further
- End product of JAD = requirement model
- End product of RAD = new information system

RAD

- Relies heavily on prototyping and user involvement
- Interactive process continues until the system is completely developed and users are satisfied



RAD



1) Requirement planning phase

- Users, managers and IT staff members discuss and agree on
 - Business needs
 - Project scope
 - Constraints
 - Systems requirements
- Requirement planning phase **ends when**
 - the team agrees on key issues AND
 - Obtain management authorization to continue

RAD

2) User design phase

- User interact with SA and develop **models and prototypes** that represent all system processes, outputs, and inputs
- Use combination of JAD techniques and CASE tool to translate user needs into working models
- Is continuous and interactive process that allow user to understand, modify and approve the working model that meets their needs

RAD



3) Construction phase

- ▣ Focus on application development like SDLC
- ▣ However, users continue to participate and still can suggest changes or improvement as actual screens or reports are developed

RAD



4) Cutover

- Similar to final phase of SDLC, includes
 - data conversion
 - Testing
 - changeover to the new system
 - User training

RAD

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- RAD Objectives
 - ▣ To cut development time and expense by involving the users in every phase of systems development
 - ▣ Successful RAD team must have IT resources, skills, and management support
 - ▣ Helps a development team design a system that requires a highly interactive or complex user interface

RAD

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- RAD Advantages and Disadvantages
 - ▣ Systems can be developed more quickly with significant cost savings
 - ▣ RAD stresses the mechanics of the system itself and does not emphasize the company's strategic business needs
 - ▣ Might allow less time to develop quality, consistency, and design standards

Agile Methods

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- Attempt to develop a system incrementally by building a series of prototypes and constantly adjusting them to user requirements
- As process continues, developers revise, extend, and merge early versions into final product
- Emphasizes continuous feedback, and incremental step is affected by what was learned in the prior steps.

Agile Methods

- Agilian modeling toolset i.e. Unified Modeling Language, entity-relationship diagrams, data flow diagrams, and business process modeling
- Some agile developers prefer not to use CASE tools at all, and rely instead on whiteboard displays and arrangements of movable sticky notes



Agile Methods

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- **Scrum** is a rugby term, another agile approach
- Agile team members play specific roles: pigs or chicken
 - ▣ Pigs include the product owner, the facilitator, and the development team
 - ▣ the chickens include users, other stakeholders, and managers
- Scrum sessions have specific guidelines that emphasize time blocks, interaction, and team-based activities that result in deliverable software

Agile Methods

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- Agile Method Advantages and Disadvantages
 - ▣ Are very flexible and efficient in dealing with change
 - ▣ Frequent deliverables constantly validate the project and reduce risk
 - ▣ Team members need a high level of technical and interpersonal skills
 - ▣ May be subject to significant change in scope

World's Biggest 'Agile' Software Project Close To Failure

Posted by **Soulskill** on Saturday May 25, 2013 @10:31AM
from the be-careful-not-to-learn-anything-from-this dept.



00_NOP writes

""[Universal Credit](#)"" — the plan to consolidate all Britain's welfare payments into one — is the world's biggest 'agile' software development project. [It is now close to collapse, the British government admitted yesterday](#). The failure, if and when it comes, could cost billions and have dire social consequences. 'Some steps have been taken to try to rescue the project. The back end — the benefits calculation — has reportedly been shifted to a "waterfall" development process — which offers some assurances that the government at least takes its fiduciary duties seriously as it should mean no code will be deployed that has not been finished. The front end — the bit used by humans — is still meant to be "agile" — which makes some sense, but where is the testing? Agile is supposed to be about openness between developer and client and we — the taxpayers — are the clients: why can't we see what our money is paying for?'"

<http://news.slashdot.org/story/13/05/25/139218/worlds-biggest-agile-software-project-close-to-failure>

U.S. Air Force pulls plug on ERP project after blowing through \$1 billion

In November, [reports emerged](#) that the U.S. Air Force had decided to scrap a major ERP (enterprise resource planning) software project called the Expeditionary Combat Support System after it racked up \$1 billion in expenses but failed to create "any significant military capability."

ECSS was supposed to replace more than 200 legacy systems. The project dated to 2005 and used [Oracle](#) software, but its ballooning costs clearly suggest that Air Force officials and systems contractor CSC conducted an overwhelming amount of additional custom coding and integration work.

An Air Force spokesman said the project would require another \$1.1 billion just to complete one-fourth of the original scope, and that wouldn't be complete until 2020.



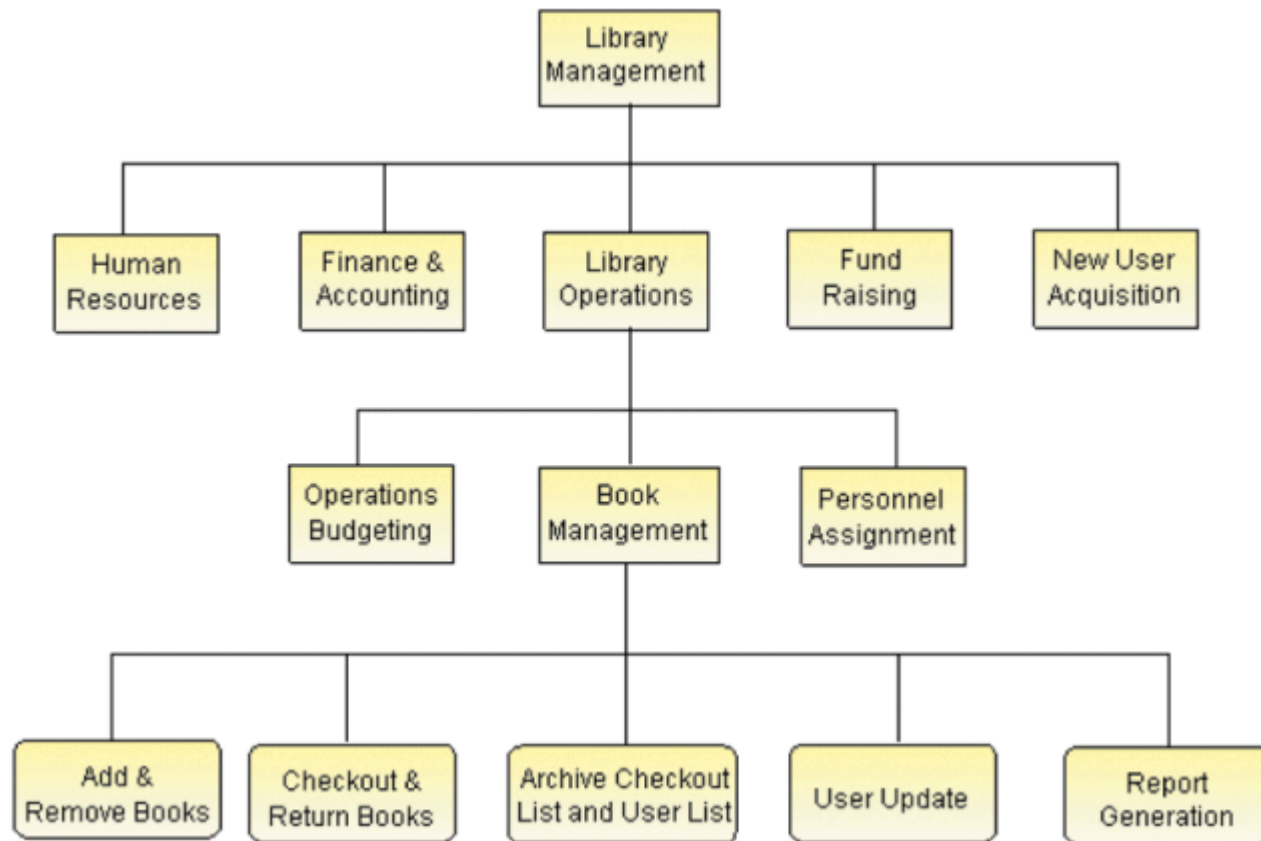
Modeling Tools

Modeling Tools

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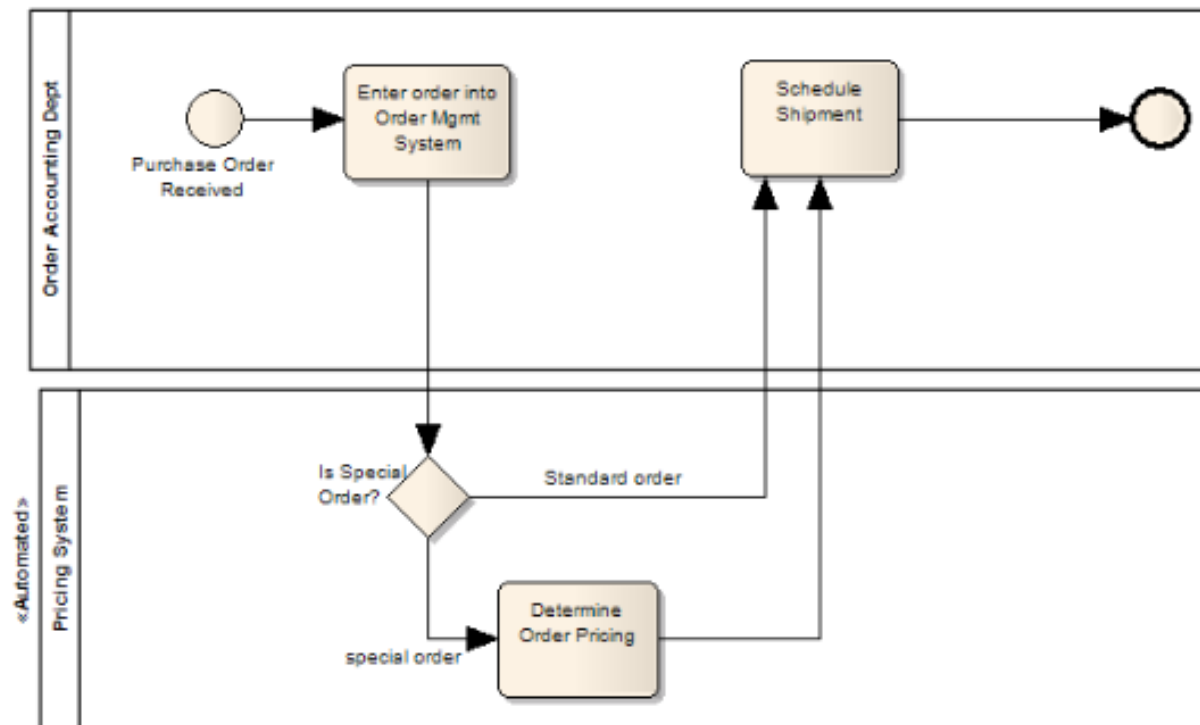
- graphical methods and nontechnical language that represent the system at various stages of development
- can use various tools
- **Functional Decomposition Diagrams**
 - Top-down representation of a function or process

Functional decomposition diagram (FDD)

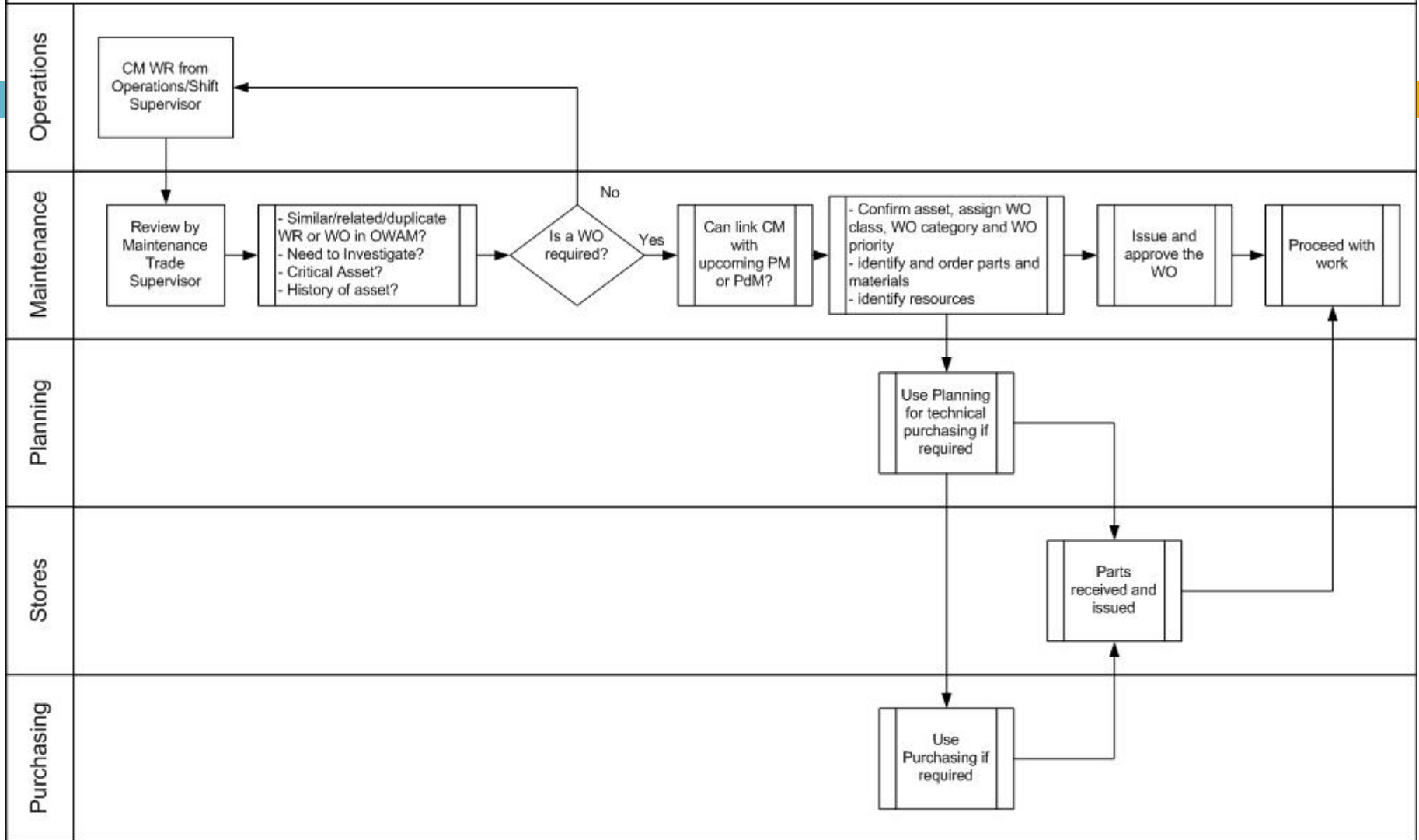


- Business Process Modeling
- Workflow diagram
 - Pool
 - Swim lanes

BPMN Automated Process Example1



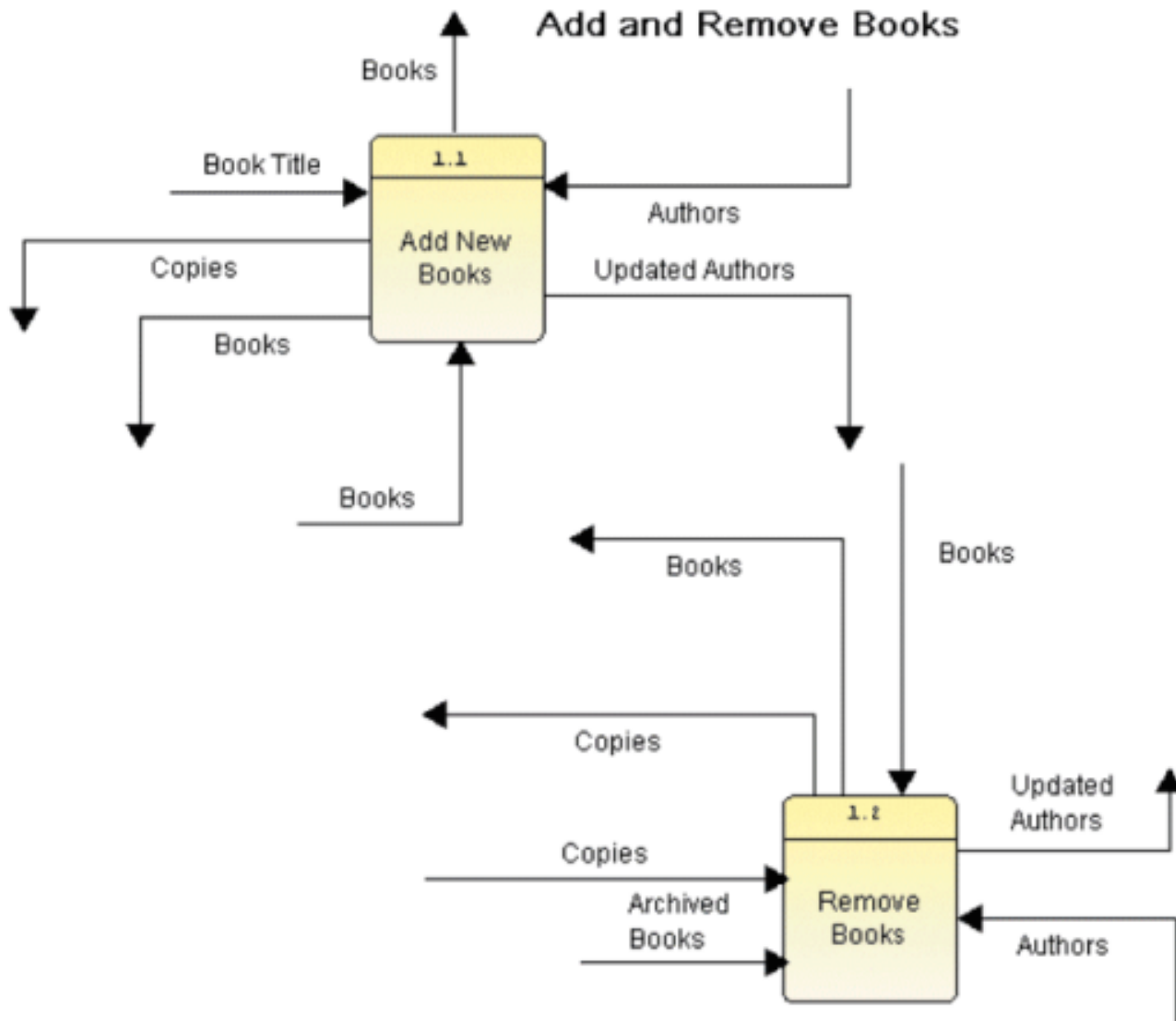
From CM WR to CM WO – Approval of Unplanned Work



■ Data Flow Diagrams

- show how the system stores, processes, and transforms data
- Additional levels of information and detail are depicted in other, related DFDs

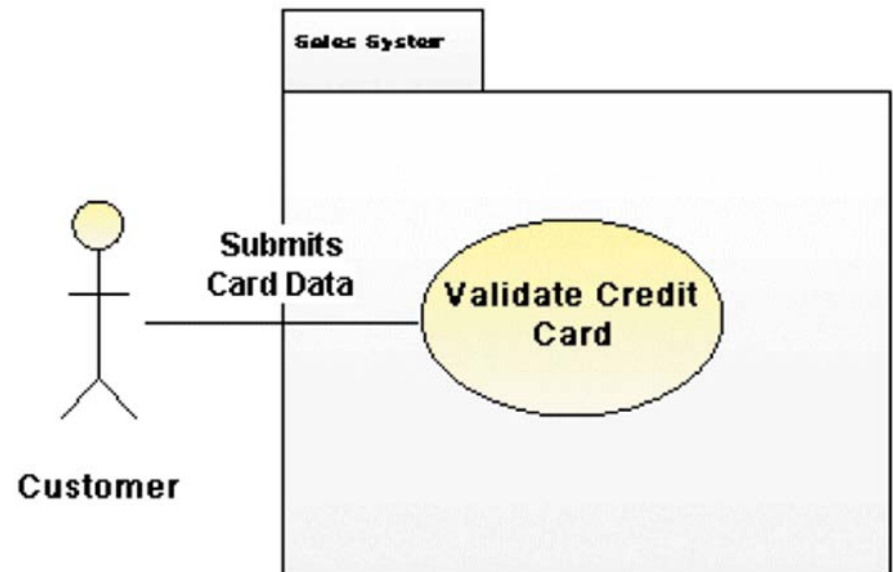
Add and Remove Books

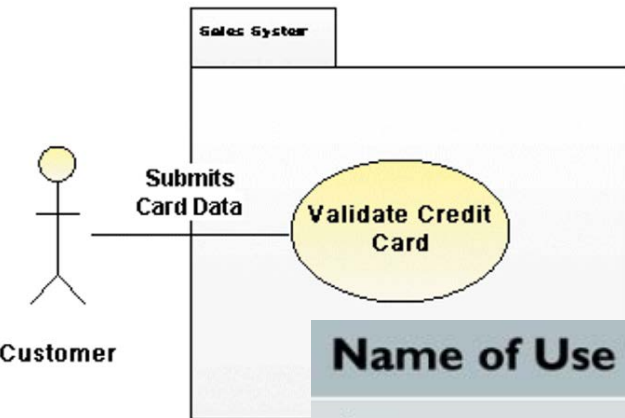


Modeling Tools and Techniques

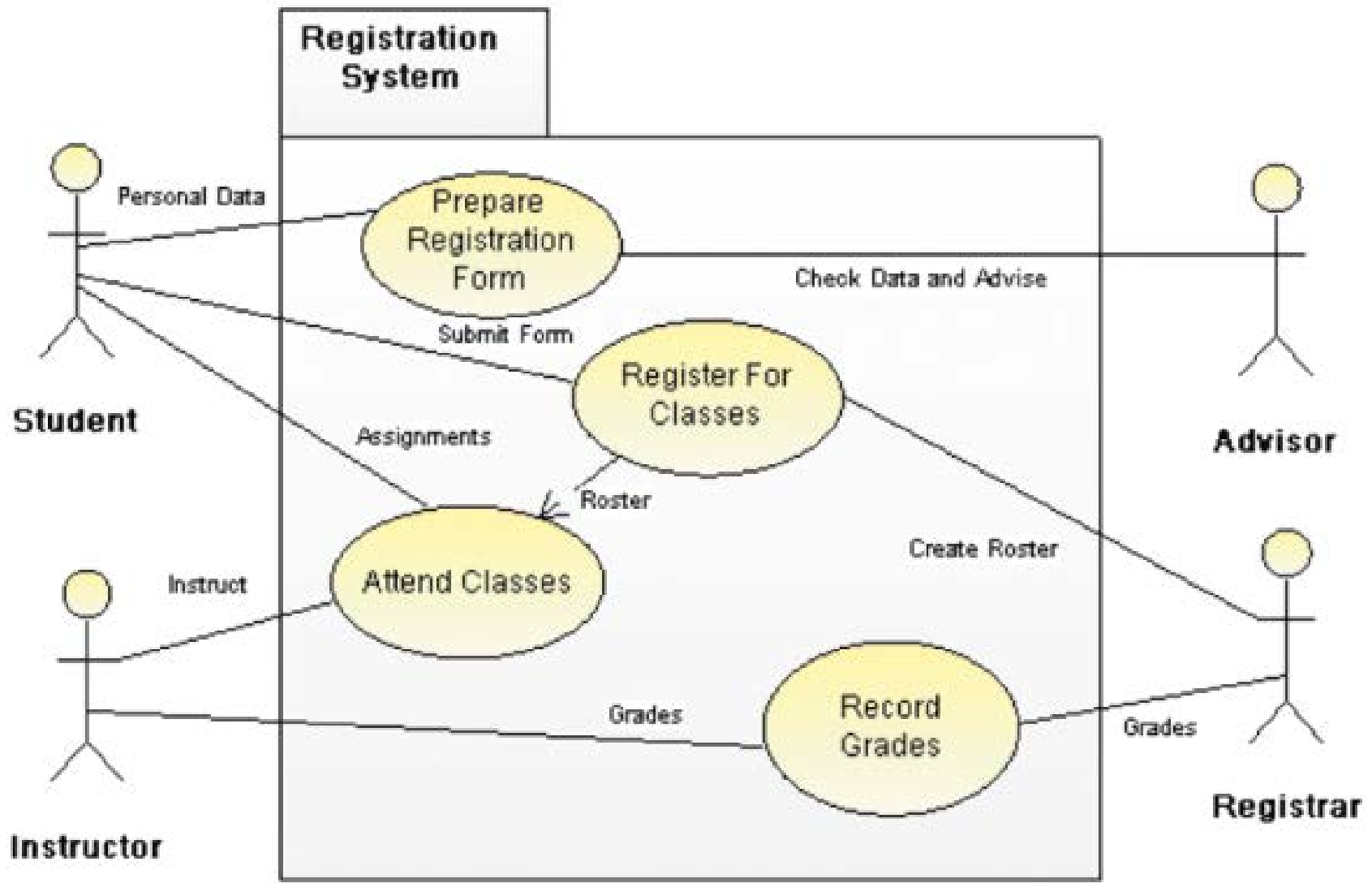
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- Unified Modeling Language
 - ▣ Widely used method of visualizing and documenting software systems design
 - ▣ Use case diagrams
 - Actor

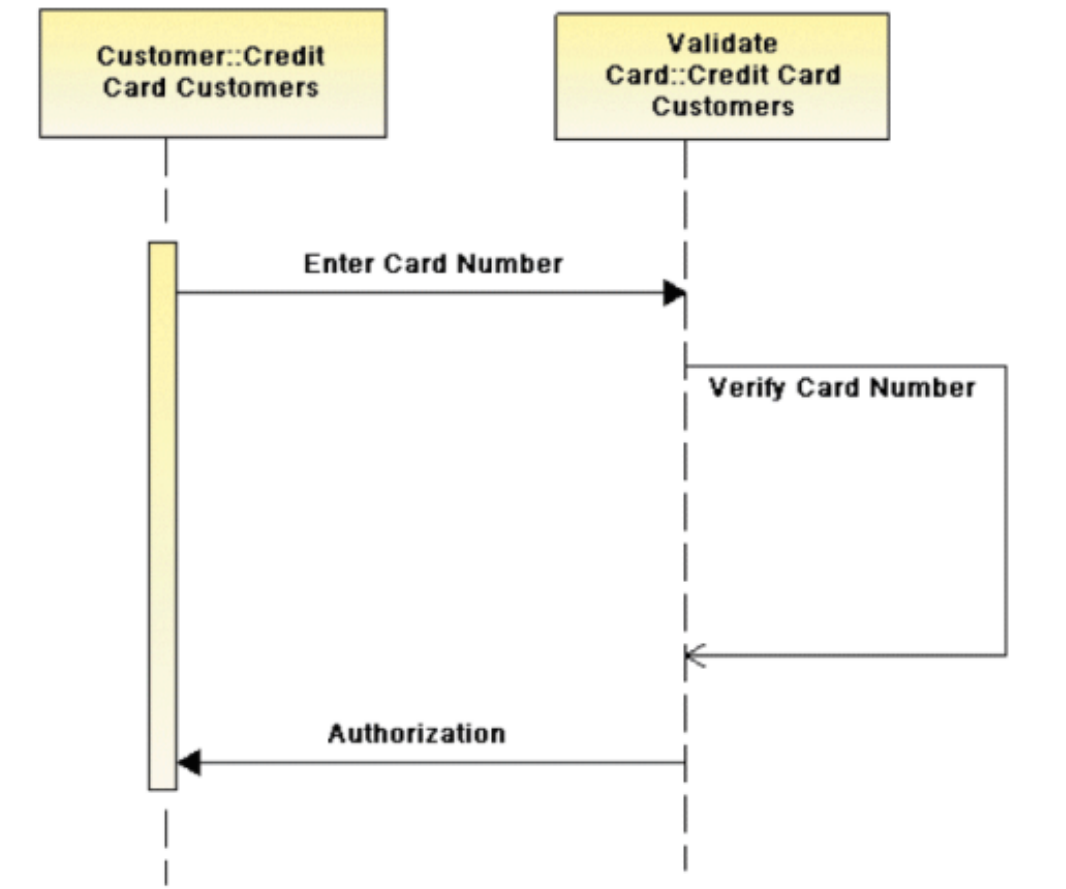




Name of Use Case:	Credit card validation process
Actor:	Customer
Description:	Describes the credit card validation process
Successful Completion:	<ol style="list-style-type: none"> 1. Customer clicks the input selector and enters credit card number and expiration date 2. System verifies card 3. System sends authorization message
Alternative:	<ol style="list-style-type: none"> 1. Customer clicks the input selector and enters credit card number and expiration date 2. System rejects card 3. System sends rejection message
Precondition:	Customer has selected at least one item and has proceeded to checkout area
Postcondition:	Credit card information has been validated Customer can continue with order
Assumptions:	None



Sequence diagrams





System Requirements Checklist

System Requirements Checklist

- A **system requirement** is a characteristic or feature that must be included in an information system to satisfy business requirements and be acceptable to users.
- System requirements serve as benchmarks to measure the overall acceptability of the finished system.
- five general categories: outputs, inputs, processes, performance, and controls.

System Requirements Checklist

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■ Outputs

- The contact management system must generate a daily reminder list for all sales reps
- The inventory system must produce a daily report showing the part number, description, quantity on hand, quantity allocated, quantity available, and unit cost of all sorted by part number
- The customer analysis system must produce a quarterly report that identifies changes in ordering patterns or trends with statistical comparisons to the previous four quarters

System Requirements Checklist

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- Inputs
 - ▣ Student grades must be entered on machine-scannable forms prepared by the instructor.
 - ▣ The department head must enter overtime hours on a separate screen
 - ▣ Data entry screens must be uniform, except for background color, which can be changed by the user

System Requirements Checklist

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■ Processes

- The warehouse distribution system must analyze daily orders and create a routing pattern for delivery trucks that maximizes efficiency and reduces unnecessary mileage.
- As the final step in year-end processing, the payroll system must update employee salaries, bonuses, and benefits and produce tax data required by the IRS

System Requirements Checklist

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- Performance
 - ▣ The system must support 25 users online simultaneously
 - ▣ Response time must not exceed four seconds
 - ▣ System must be operational seven days a week, 365 days a year
 - ▣ The student records system must produce class lists within five hours after the end of registration

System Requirements Checklist

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- Controls
 - The manager of the sales department must approve orders that exceed a customer's credit limit
 - The system must maintain separate levels of security for users and the system administrator
 - An employee record must be added, changed, or deleted only by a member of the human resources department
 - All transactions must have audit trails

Future Growth, Costs, and Benefits

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■ Scalability

- need information about projected future volume for all outputs, inputs, and processes
- Transaction volume has a significant impact on operating costs. When volume exceeds a system's limitations, maintenance costs increase sharply. Volume can change dramatically if a company expands or enters a new line of business.
- need to determine how much data storage is required currently and predict future needs based on system activity and growth.



Fact-finding techniques

Fact-Finding

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- Fact-Finding Overview
 - First, you must identify the information you need
 - Develop a fact-finding plan
- Who, What, Where, When, How, and Why?
 - Difference between asking what is being done and what

CURRENT SYSTEM		PROPOSED SYSTEM
Who does it?	Why does this person do it?	Who should do it?
What is done?	Why is it done?	What should be done?
Where is it done?	Why is it done there?	Where should it be done?
When is it done?	Why is it done then?	When should it be done?
How is it done?	Why is it done this way?	How should it be done?

Fact-Finding



	What Data	How Function	Where Network	Who People	When Time	Why Motivation
Scope Planner	List of Things ENTITY = Class of Business Entities	List of Processes PROCESS = Class of Business Processes	List of Locations NODE = Class of Business Locations	List of Organizations PEOPLE = Class of Business Organizations	List of Cycles CYCLE = Class of Business Cycles	List of Goals END = Class of Business Objectives
Business Model (Conceptual) Owner	e.g. Semantic Model ENTITY = Business Entity RELATION = Business Relationship	e.g. Business Process Model VO = Business Resources PROCESS = Business Process	e.g. Logistics Network NODE = Business Location LINK = Business Linkage	e.g. Work Flow Model PEOPLE = Organization Unit WORK = Work Product	e.g. Master Schedule TIME = Business Event CYCLE = Business Cycle	e.g. Business Plan ENDS = Business Objective MEANS = Business Strategy
System Model (Logical) Designer	e.g. Logical Data Model ENTITY = Data Entity RELATION = Data Relationship	e.g. Application Architecture VO = User Views PROCESS = Application Function	e.g. Distributed System Architecture NODE = IS Function LINK = Line Characteristics	e.g. Human Interface Architecture PEOPLE = Role WORK = Software	e.g. Processing Structure TIME = System Event CYCLE = Processing Cycle	e.g. Business Rule Model ENDS = Structural Assertion MEANS = Action Assertion
Technology Model (Physical) Builder	e.g. Data Design ENTITY = Table/Sequence/View RELATION = Key/Relationship	e.g. System Design VO = Data Elements/Sets PROCESS = Computer Function	e.g. Technology Architecture NODE = Hardware/System Software LINK = Line Specifications	e.g. Presentation Architecture PEOPLE = User WORK = Screen/Device Formats	e.g. Control Structure TIME = Event CYCLE = Component Cycle	e.g. Rule Design ENDS = Condition MEANS = Action
Detailed Representations Subcontractor	e.g. Data Definition ENTITY = Field RELATION = Address	e.g. Program VO = Control Block PROCESS = Language Statement	e.g. Network Architecture NODE = Address LINK = Protocol	e.g. Security Architecture PEOPLE = Identity WORK = Job	e.g. Timing Definition TIME = Interval CYCLE = Machine Cycle	e.g. Rule Specification ENDS = Sub-condition MEANS = Step

- The Zachman Framework
 - Zachman Framework for Enterprise Architecture
 - Helps managers and users understand the model and assures that overall business goals translate into successful IT projects

Interviews

- **Step 1:** Determine the People to Interview
 - ▣ Informal structures
- **Step 2:** Establish Objectives for the Interview
 - ▣ Determine the general areas to be discussed
 - ▣ List the facts you want to gather



Interviews

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- **Step 3: Develop Interview Questions**
 - ▣ Creating a standard list of interview questions helps to keep you on track and avoid unnecessary tangents
 - ▣ Avoid leading questions
 - ▣ Open-ended questions
 - ▣ Closed-ended questions
 - ▣ Range-of-response questions

Interviews

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- **Step 4:** Prepare for the Interview
 - ▣ Careful preparation is essential because an interview is an important meeting and not just a casual chat
 - ▣ Limit the interview to no more than one hour
 - ▣ Send a list of topics
 - ▣ Ask the interviewee to have samples available

To... [Hector Arvizu \(harvisu@cti.hq.hr.org\)](mailto:harvisu@cti.hq.hr.org)

Cc... [Ernie Kubinski \(ekubinski@cti.hq.hr.org\)](mailto:ekubinski@cti.hq.hr.org); [Ross Casey \(rcasey@cti.hq.hr.org\)](mailto:rcasey@cti.hq.hr.org); [Tawanda Lee \(tle@cti.hq.hr.org\)](mailto:tle@cti.hq.hr.org)

Subject: Sales incentive pay system

Hector,

I am working on the new sales incentive pay system, and I need to learn more about user requirements. I plan to meet with three members of your staff to discuss the new system:

[Ernie Kubinski](#), October 19 at 9:30 a.m.

[Ross Casey](#), October 19 at 3:00 p.m.

[Tawanda Lee](#), October 20 at 1:00 p.m.

I want to complete the systems analysis phase by the end of October, and I will send you a copy of the system requirements document at that time. If you have any questions, please let me know.

Betty

To... [Ross Casey \(rcasey@cti.hr.hr.org\)](mailto:rcasey@cti.hr.hr.org)

Cc... [Hector Arvizu \(harvisu@cti.hq.hr.org\)](mailto:harvisu@cti.hq.hr.org)

Subject: Interview

Ross,

This will confirm my interview with you in your office at 3:00 p.m. on October 19. I would like to learn more about how sales compensation is handled now, and what the requirements will be for the new system. Here are some specific topics I would like to discuss:

- Will the new system be implemented at all company locations?
- Do you want the new system to become operational at the end of this year?
- Will the new system require changes in Federal or State tax deductions?
- What security provisions are required in the new system?
- Who will participate on the JAD team?
- How often do you anticipate changes in incentive pay formulas?

If you have any written procedures or forms that document the current system, please have copies available so I can review them when we meet. If you need to reach me, I'll be traveling, but I will check my e-mail and voice messages several times a day. Thanks for your cooperation.

Betty

Interviews

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- **Step 5: Conduct the Interview**
 - ▣ Develop a specific plan for the meeting
 - ▣ Begin by introducing yourself, describing the project, and explaining your interview objectives
 - ▣ **Engaged listening**
 - ▣ Allow the person enough time to think about the question
 - ▣ After an interview, you should summarize the session and seek a confirmation

Interviews

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- **Step 6: Document the Interview**
 - ▣ Note taking should be kept to a minimum
 - ▣ After conducting the interview, you must record the information quickly
 - ▣ After the interview, send memo to the interviewee expressing your appreciation
 - ▣ Note date, time, location, purpose of the interview, and the main points you discussed so the interviewee has a written summary and can offer additions or corrections

Interviews

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- **Step 7: Evaluate the Interview**
 - ▣ In addition to recording the facts obtained in an interview, try to identify any possible biases

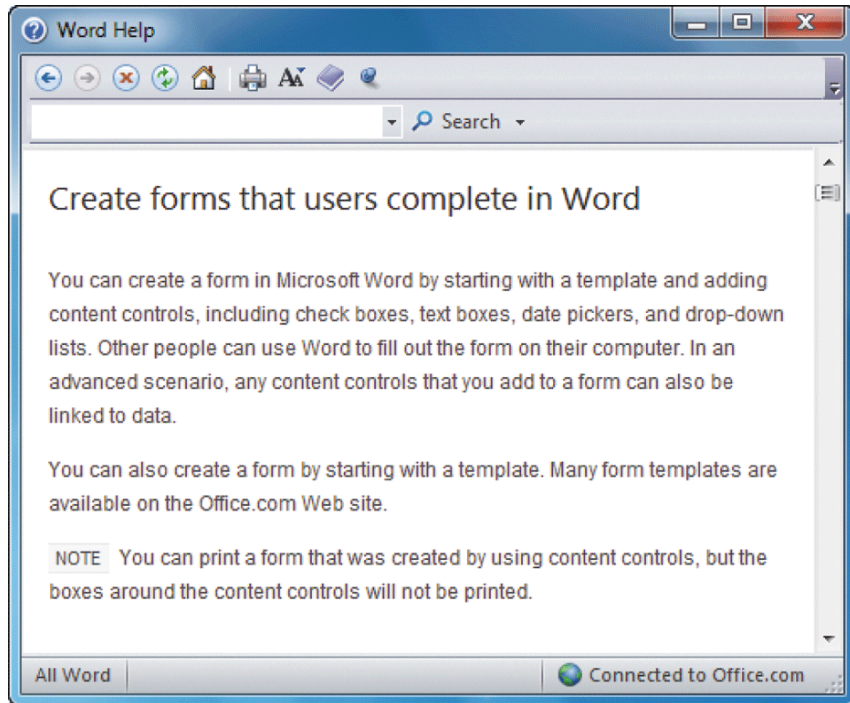
- **Unsuccessful Interviews**
 - ▣ No matter how well you prepare for interviews, some are not successful

Other Fact-Finding Techniques

- Document Review
- Observation
 - Seeing the system in action gives you additional perspective and a better understanding of the system procedures
 - Plan your observations in advance
 - Hawthorne Effect



Other Fact-Finding Techniques



- Questionnaires and Surveys
 - When designing a questionnaire, the most important rule of all is to make sure that your questions collect the right data in a form that you can use to further your fact-finding
 - Fill-in form

Questionnaire

PURCHASE REQUISITION QUESTIONNAIRE

Pat Kline, Vice President, Finance, has asked us to investigate the purchase requisition process to see if it can be improved. Your input concerning this requisition process will be very valuable. We would greatly appreciate it if you could complete the following questionnaire and return it by March 10 to Dana Juarez in information technology. If you have any questions, please call Dana at x2561.

A. YOUR OBSERVATIONS

Please answer each question by checking one box.

1. How many purchase requisitions did you process in the past five working days? _____

2. What percentage of your time is spent processing requisitions?

- under 20% 60-79%
 21-39% 80% or more
 40-59%

3. Do you believe too many errors exist on requisitions?

- yes
 no

4. Out of every 100 requisitions you process, how many contain errors?

- fewer than 5 20 to 29
 5 to 9 30 to 39
 10 to 14 40 to 49
 15 to 19 50 or more

5. What errors do you see most often on requisitions? (Place a 1 next to the most common error, place a 2 next to the second, etc.)

- incorrect charge number missing authorization
 missing charge information other (please explain) _____
 arithmetic errors
 incorrect discount percent used

B. YOUR SUGGESTIONS

Please be specific, and give examples if possible.

1. If the currently used purchase requisition form were to be redesigned, what changes to the form would you recommend?

(If necessary, please attach another sheet)

2. Would you be interested in meeting with an information technology representative to discuss your ideas further? If so, please complete the following information:

Name _____ Department _____

Telephone _____ E-mail address _____

Questionnaire

- Keep the questionnaire brief and user-friendly
- Provide clear instructions
- Arrange the questions in a logical order, going from simple to more complex topics
- Phrase questions to avoid misunderstandings, use simple terms and wording
- Try not to lead the response or use questions that give clues to expected answers

Questionnaire

- Limit the use of open-ended questions that are difficult to tabulate
- Limit the use of questions that can raise concerns about job security or other negative issues
- Include a section at the end of questionnaire for general comments
- Test the questionnaire whenever possible on a small test group before finalizing it

Other Fact-Finding Techniques

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- Sampling
 - Systematic sample
 - Stratified sample
 - Random sample
 - Main objective of a sample is to ensure that it represents the overall population accurately

Other Fact-Finding Techniques

- Research
 - ▣ Can include the Internet, IT magazines, and books to obtain background information, technical material, and news about industry trends and developments
 - ▣ Site visit



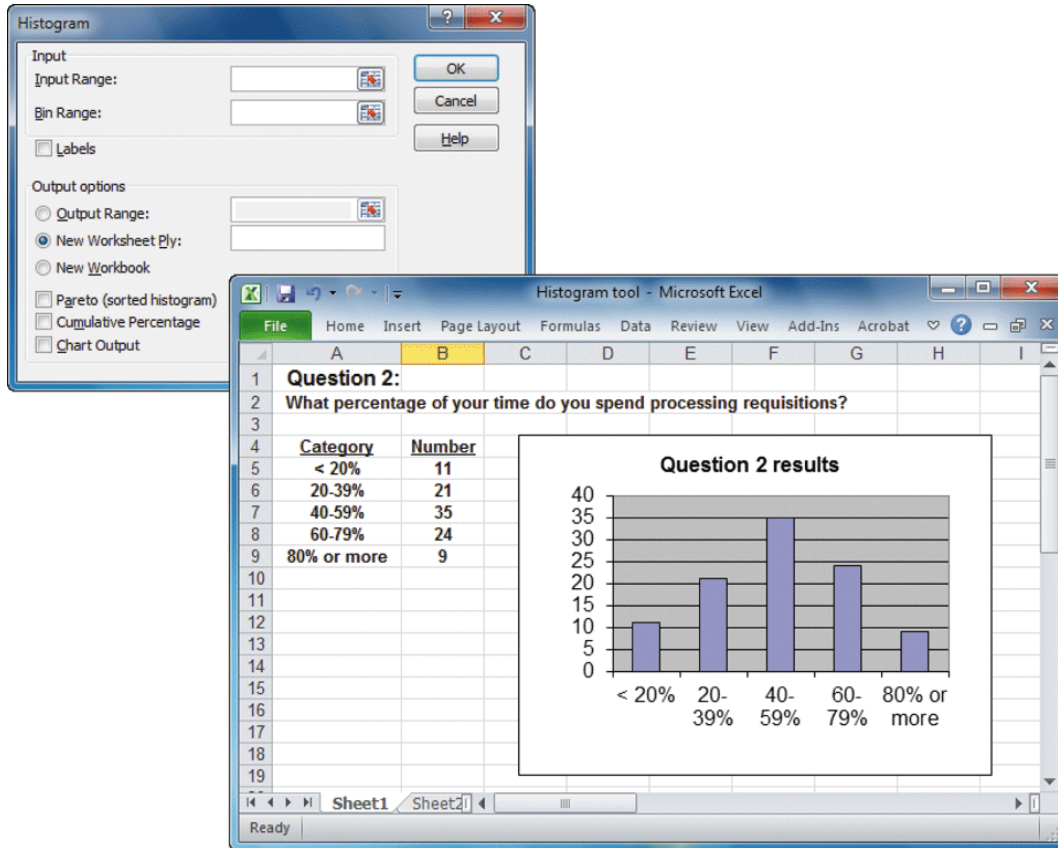
- Interviews versus Questionnaires
 - Interview is more familiar and personal
 - Questionnaire gives many people the opportunity to provide input and suggestions
 - Brainstorming
 - Structured brainstorming
 - Unstructured brainstorming

Documentation

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- The Need for Recording the Facts
 - ▣ Record information as soon as you obtain it
 - ▣ Use the simplest recording method
 - ▣ Record your findings in such a way that they can be understood by someone else
 - ▣ Organize your documentation so related material is located easily

Documentation

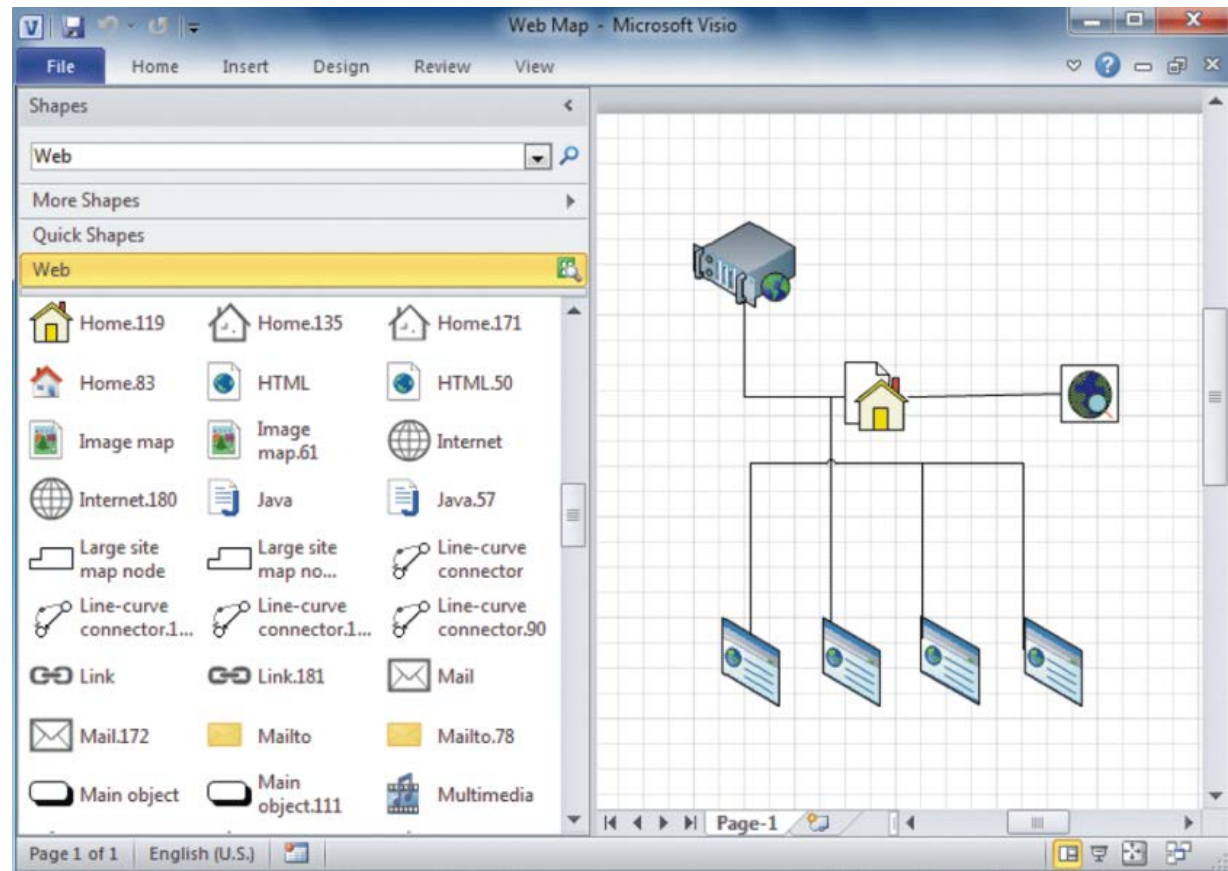


- Software Tools
 - CASE Tools
 - Productivity Software
 - Word processing, spreadsheets, database management, presentation graphics, and collaborative software programs
 - Histogram

Documentation

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- Software Tools
 - ▣ Graphics modeling software



- Personal information managers



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Preview of Logical Modeling

- At the conclusion of requirements modeling, systems developers should have a clear understanding of business processes and system requirements
- The next step is to construct a logical model of the system
- IT professionals have differing views about systems development methodologies, and no universally accepted approach exists