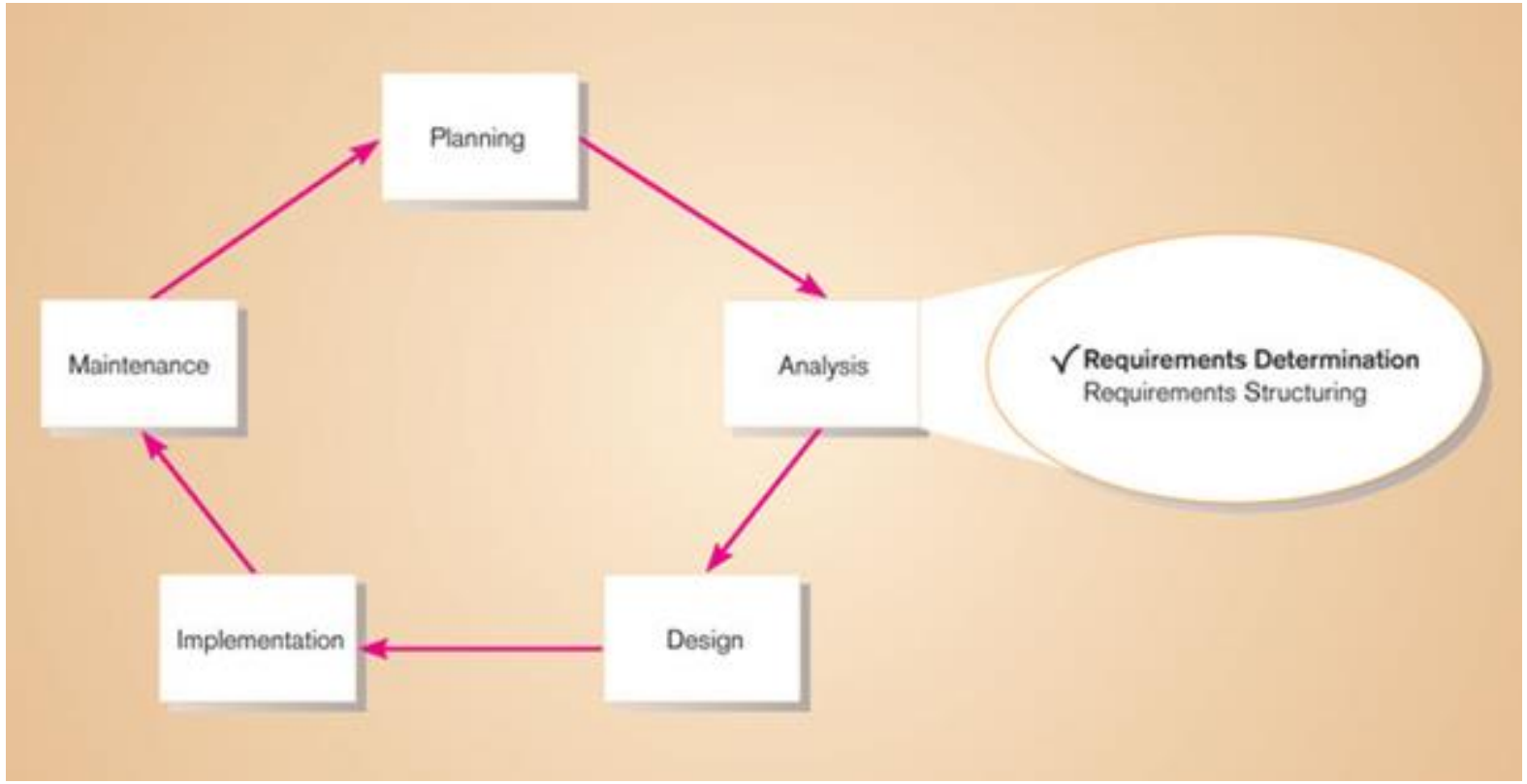
System Analysis and Design

Prof. Rania Elgohary
rania.elgohary@cis.asu.edu.eg
Dr. Yasmine Afify
yasmine.afify@cis.asu.edu.eg

Analysis Phase



- **Who** will use the system.
- **What** the system will do.
- **Where** and **when** it will be used.

Two Sub phases:

1- **Requirements Determination:**

Careful study of organization **current procedures** and the **information systems used** to perform organizational tasks.

2- Requirements Structuring

Relationships between requirements and eliminating redundancy

SRS

- The main aim of determining the information requirements of an organization used by analysts is to prepare a precise software requirement specification SRS understood by user.
- Ideal SRS Document should:
  - be complete, unambiguous, and jargon-free.
  - specify operational and strategic information requirements.
  - solve possible disputes between users and analyst.
  - use graphical aids which simplify understanding and design.

Requirement Determination

1- Prepare for Elicitation

2- Conduct Elicitation

3- Confirm Elicitation results

4- Communicate Information

5- Manage Stakeholder Collaboration

2- Conduct Elicitation

- The purpose of Conduct Elicitation is to **draw out**, **explore**, and **identify** information relevant to the change.

Elicitation Techniques:

1- Traditional Methods

a- Interviewing and Listening

b- Interviewing Groups

c- Survey/Questionnaire

d- Ethnography

f- Analyzing procedures and other documents

2- Modern Methods

a- Joint Application Design

b- Case tools

c- Prototyping

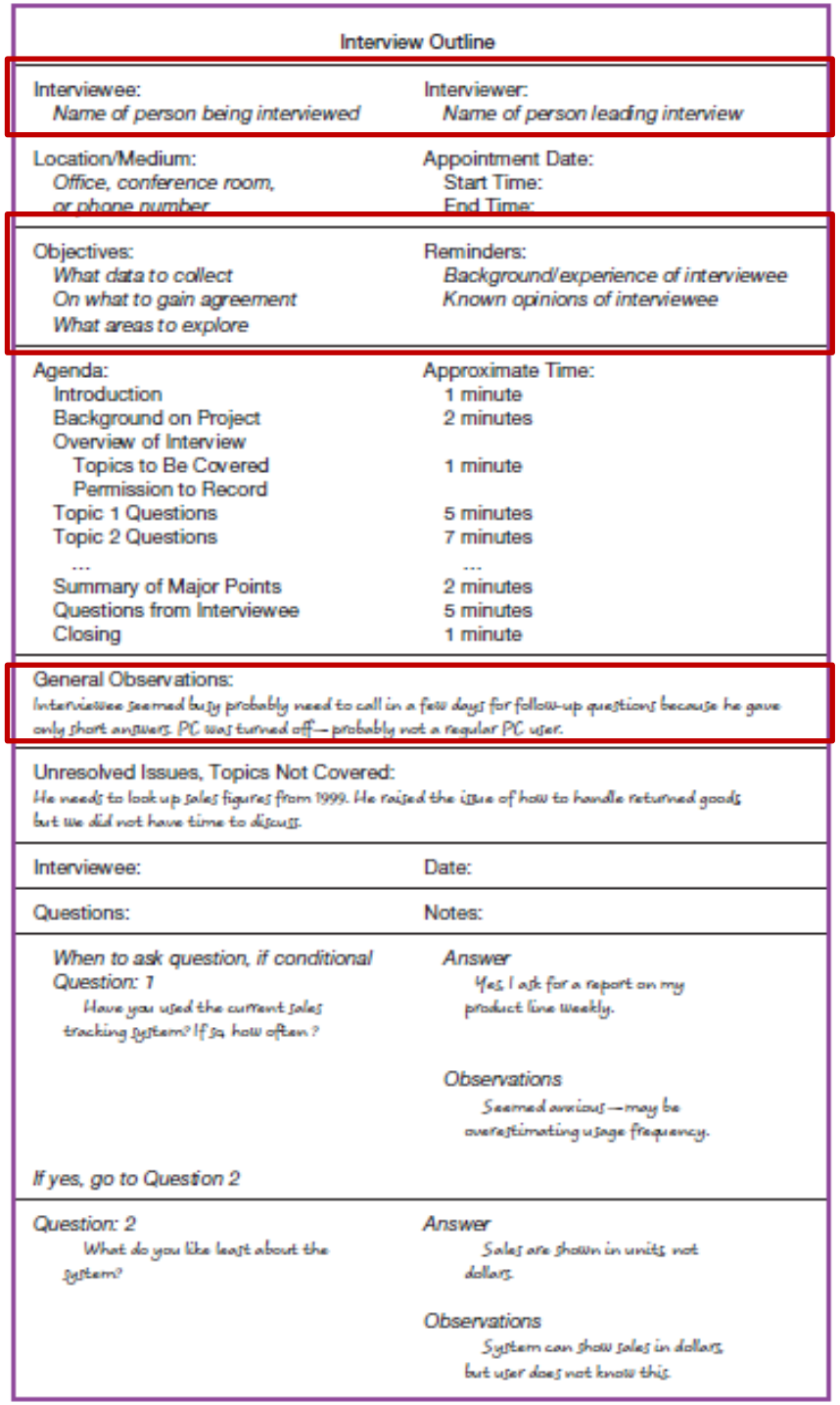
Traditional Requirements Determination Methods

- Interviewing individuals
- Interviewing groups
- Survey/Questionnaire
- Ethnography
- Studying business documents

What is Interviewing?

- ***Dialogue*** with ***stakeholder*** to obtain their ***requirements.***

- During interviewing you will gather ***facts***, ***opinions***, and ***observe body language***, ***emotions***, and other signs of what people ***want*** and ***how*** they assess current systems.



Interview Outline

Interviewee: *Name of person being interviewed*
Interviewer: *Name of person leading interview*

Location/Medium: *Office, conference room, or phone number*
Appointment Date:
Start Time:
End Time:

Objectives:
What data to collect
On what to gain agreement
What areas to explore

Reminders:
Background/experience of interviewee
Known opinions of interviewee

Agenda:	Approximate Time:
Introduction	1 minute
Background on Project	2 minutes
Overview of Interview	
Topics to Be Covered	1 minute
Permission to Record	
Topic 1 Questions	5 minutes
Topic 2 Questions	7 minutes
...	...
Summary of Major Points	2 minutes
Questions from Interviewee	5 minutes
Closing	1 minute

General Observations:
Interviewee seemed busy probably need to call in a few days for follow-up questions because he gave only short answers. PC was turned off—probably not a regular PC user.

Unresolved Issues, Topics Not Covered:
He needs to look up sales figures from 1999. He raised the issue of how to handle returned goods but we did not have time to discuss.

Interviewee: Date:

Questions: Notes:

When to ask question, if conditional
Question: 1
Have you used the current sales tracking system? If so, how often?

Answer
Yes, I ask for a report on my product line weekly.

Observations
Seemed anxious—may be overestimating usage frequency.

If yes, go to Question 2

Question: 2
What do you like least about the system?

Answer
Sales are shown in units, not dollars.

Observations
System can show sales in dollars, but user does not know this.

- Interview Guide is a document for developing, planning and conducting an interview.

- Each question in an interview guide can include both verbal and non-verbal information.

- Basic information on ***who*** is ***being interviewed*** and ***when***.

- Major ***objectives*** for the interview.

- Reminder ***notes to yourself*** on ***key information*** about the ***interviewee*** (e.g., job history, known positions taken on issues, and role with current system)

- ***Agenda*** for the interview with approximate ***time limits***.

Choosing Interview Questions- Open-ended Questions

- Are used to probe for ***information*** for which you ***cannot anticipate*** all possible responses or for ***which you do not know the precise question*** to ask.

"What would you say is the best thing about the information system you currently use to do your job?" or "List the three most frequently used menu options."

- The person being interviewed is ***encouraged*** to talk about ***whatever interests him*** or her ***within the general bounds*** of the question.
- You must ***react quickly*** to answers and determine whether or not any ***follow-up questions*** are needed for clarification or elaboration.
- Sometimes ***body language*** will suggest that a user has given an incomplete answer.

Choosing Interview Questions- Open-ended Questions

Advantage:

- ***Previously unknown*** information can ***surface***. You can then ***continue exploring*** along unexpected lines of inquiry to reveal even more new information.
- Often ***put*** the ***interviewees*** at ***ease*** because they are able to respond in their ***own words*** using their ***own structure.***
- Give interviewees more of a ***sense of involvement*** and ***control*** in the interview.

Disadvantage:

- The ***length of time*** it can take for the questions to be answered.
- ***Difficult to summarize***.

Choosing Interview Questions- Closed-ended Questions

- Provide a ***range of answers*** from which the interviewee may ***choose***.

- Example:

Which of the following would you say is the one best thing about the information system you currently use to do your job (pick only one)?

a. Having easy access to all of the data you need
b. The system's response time
c. The ability to access the system from remote locations

Choosing Interview Questions- Closed-ended Questions

Advantages

- work well when the ***major answers*** to questions are ***well known***.
- ***do not*** necessarily ***require*** a ***large time***
- can be an ***easy way to begin an interview*** and to determine which line of open-ended questions to pursue.
- you can include an "***other***" option to encourage the interviewee to add unanticipated responses.

disadvantage

- useful information that ***does not quite fit into the defined answers may be overlooked*** as the respondent tries to make a choice instead of providing his or her best answer.

Guidelines for Effective Interviewing

- ***Plan*** the interview.
  - Prepare interviewee: appointment, priming questions.
  - Prepare agenda, checklist, questions.
- ***Listen carefully*** and take notes (tape record if permitted).
- ***Review notes*** within 48 hours.
- ***Be neutral.***

Advantages/Disadvantages of Individual Interviews

- Interview one person at a time
- Advantage
  - **Easier** to **schedule** than group interviews
- Disadvantages
  - **Contradictions** and **inconsistencies** between interviewees
  - **Follow-up** discussions are time consuming

Group Interviews

- Interview several key people together.
- ***Several Analysts*** could be involved.
- Advantages
  - More ***effective use of time***
  - Can hear ***agreements*** and ***disagreements*** at once
  - Opportunity for ***synergies***
- Disadvantage
  - ***More difficult to schedule*** than individual interviews

Nominal Group Technique (NGT)

- A ***facilitated*** process that supports ***idea generation*** by ***groups***.
- Process
  - Members come together as a group, but initially work separately.
  - Each person writes ideas.
  - Facilitator reads ideas out loud, and they are written on blackboard.
  - Group discusses the ideas.
  - Ideas are prioritized, combined, selected, reduced.
- In requirement determination context, NGT applies to ***problems*** with the ***existing system*** or ***ideas*** for ***new features*** in the system being developed.
- The end result would be a list of either ***problems or features*** that group members themselves had ***generated*** and ***prioritized***.

Survey/Questionnaire

- Is used to elicit ***business analysis information*** including information about ***customers***, ***products***, ***work practices***, and ***attitudes***—from a ***group of people*** in a ***structured way*** and in a ***relatively short period of time***.

There are two types of questions used in a survey or questionnaire:

- **Close-ended:**

  Easier to analyze because they can be tied to ***numerical coefficients***.

- **Open-ended:**

  Useful when the ***issues are known*** and the ***range*** of user ***responses is not***;

  more ***difficult*** and ***time-consuming***.

Survey/Questionnaire (Cont.)

Strengths

- ***Quick*** and relatively ***inexpensive*** to administer.
- ***Easier*** to ***collect information*** from a ***larger audience***.
- ***Does not*** typically require ***significant time***.
- Suitable for stakeholders are ***geographically dispersed***.
- Effective for obtaining ***quantitative data*** for ***statistical analysis***.
- ***Results*** may yield ***insights*** and ***opinions***.

Survey/Questionnaire (Cont.)

Limitations

- To achieve unbiased results***, specialized skills*** in statistical ***sampling*** methods are needed when surveying a subset of potential respondents.
- The ***response rates*** may be ***too low*** for statistical significance.
- Use of ***open-ended questions*** requires ***more analysis***.
- ***Ambiguous questions*** may be ***unanswered*** or answered incorrectly.
- Require ***follow-up questions*** or more survey iterations depending on the answers provided.

Ethnography

- ***Watching*** users ***do*** their ***jobs***
- Can provide ***more accurate information*** than ***self-reporting*** (Ex: Manager, Emails)

- Observation can ***cause*** people to ***change*** their ***normal operating behavior***
- Observation yields only a ***small segment of data*** from a possibly vast variety of data sources
- **Not-continuous**, you receive only a snapshot image of person or task
- Observation is ***very time consuming***

- Ex: Lost Soft Drink Sales

Lost Soft Drink Sales

A systems analyst was quite surprised to read that sales of all soft-drink products were lower, instead of higher, after a new delivery truck routing system was installed. The software was designed to reduce stock-outs at customer sites by allowing drivers to visit each customer more often using more efficient delivery routes.

Confused by the results, management asked the analyst to delay a scheduled vacation, but he insisted that he could look afresh at the system only after a few overdue days of rest and relaxation.

Instead of taking a vacation, however, the analyst called a delivery dispatcher he interviewed during the design of the system and asked to be given a route for a few days. The analyst drove a route (for a regular driver who was actually on vacation), following the schedule developed from the new system. What the analyst discovered was that the route was very efficient, as expected; so at first the analyst could not see any reason for lost sales.

During the third and last day of his "vacation," the analyst stayed overtime at one store to ask the manager if she had any ideas why sales might have dropped off in recent weeks. The manager had no explanation but did make a seemingly unrelated observation that the regular route driver appeared to have less time to spend in the store. He did not seem to take as much interest in where the products were displayed and did not ask for promotional signs to be displayed, as he had often done in the past.

From this conversation, the analyst concluded that the new delivery truck routing system was, in one sense, too good. It placed the driver on such a tight schedule that he had no time left for the "schmoozing" required to get special treatment, which gave the company's products an edge over the competition.

Without firsthand observation of the system in action gained by participating as a system user, the analyst might never have discovered the true problem with the system design. Once time was allotted for not only stocking new products but also for necessary marketing work, product sales returned to and exceeded levels achieved before the new system had been introduced.

Analyzing Procedures and Other Documents

- ***Review*** of ***existing business documents***
- Can give a ***historical*** and "***formal***" view of system requirements
- Types of information to be discovered:
  - Problems with existing system (e.g., missing information)
  - Opportunity to meet new need (e.g., analysis of sales based on customer type)
  - Names of key individuals (sales manager who study of buying behavior of key customers)
  - Reasons for current system design (e.g., data about a customer's purchase of competitors' products were not available)
  - Rules for processing data (e.g., each customer is assigned exactly one sales department staff member as a primary contact if the customer has any questions).

Analyzing Procedures and Other Documents (cont.)

Four types of useful documents

1- Written work procedures

- Describes ***how*** a ***job*** is ***performed***
- Includes ***data*** and ***information used*** and ***created*** in the process of performing the job or task

2- Business form

- Explicitly indicate data flow in or out of a system

3- Report

- Enables the analyst to work backwards from the report to the data that generated it

4- Description of current information system

GUIDE FOR PREPARATION OF INVENTION DISCLOSURE
(See FACULTY and STAFF MANUALS for Detailed
Patent Policy and Routing Procedures.)

(1) DISCLOSE ONLY ONE INVENTION PER FORM.

(2) PREPARE COMPLETE DISCLOSURE.

The disclosure of your invention is adequate for patent purposes ONLY if it enables a person skilled in the art to understand the invention.

(3) CONSIDER THE FOLLOWING IN PREPARING A COMPLETE DISCLOSURE:

(a) All essential elements of the invention, their relationship to one another, and their mode of operation.

(b) Equivalents that can be substituted for any elements.

(c) List of features believed to be new

(d) Advantages this invention has over the prior art.

(e) Whether the invention has been built and/or tested.

(4) PROVIDE APPROPRIATE ADDITIONAL MATERIAL.

Drawings and descriptive material should be provided as needed to clarify the disclosure. Each page of this material must be signed and dated by each inventor and properly witnessed. A copy of any current and/or planned publication relating to the invention should be included.

(5) INDICATE PRIOR KNOWLEDGE AND INFORMATION.

Pertinent publications, patents or previous devices, and related research or engineering activities should be identified.

(6) HAVE DISCLOSURE WITNESSED.

Persons other than coinventors should serve as witnesses and should sign each sheet of the disclosure only after reading and understanding the disclosure.

(7) FORWARD ORIGINAL PLUS ONE COPY (two copies if supported by grant/contract) TO VICE PRESIDENT FOR RESEARCH VIA DEPARTMENT HEAD AND DEAN.

Written work procedure is a **business document** that formally describes **work processes,** provides useful information regarding **system functionality and logic.**

Potential Problems with Procedure Documents

- May involve duplication of effort
- May have missing procedures
- May be out of date
- May contradict information obtained through interviews

- **Formal**
  - The official way a system works as described in organization's documentation
  - Procedure documents describe formal system
- **Informal**
  - The way a system actually works in practice
  - Interviews and observation reveal informal system

Analyzing Procedures and Other Documents (cont.)

- Four types of useful documents

1- Written work procedures

- Describes how a job is performed
- Includes data and information used and created in the process of performing the job or task

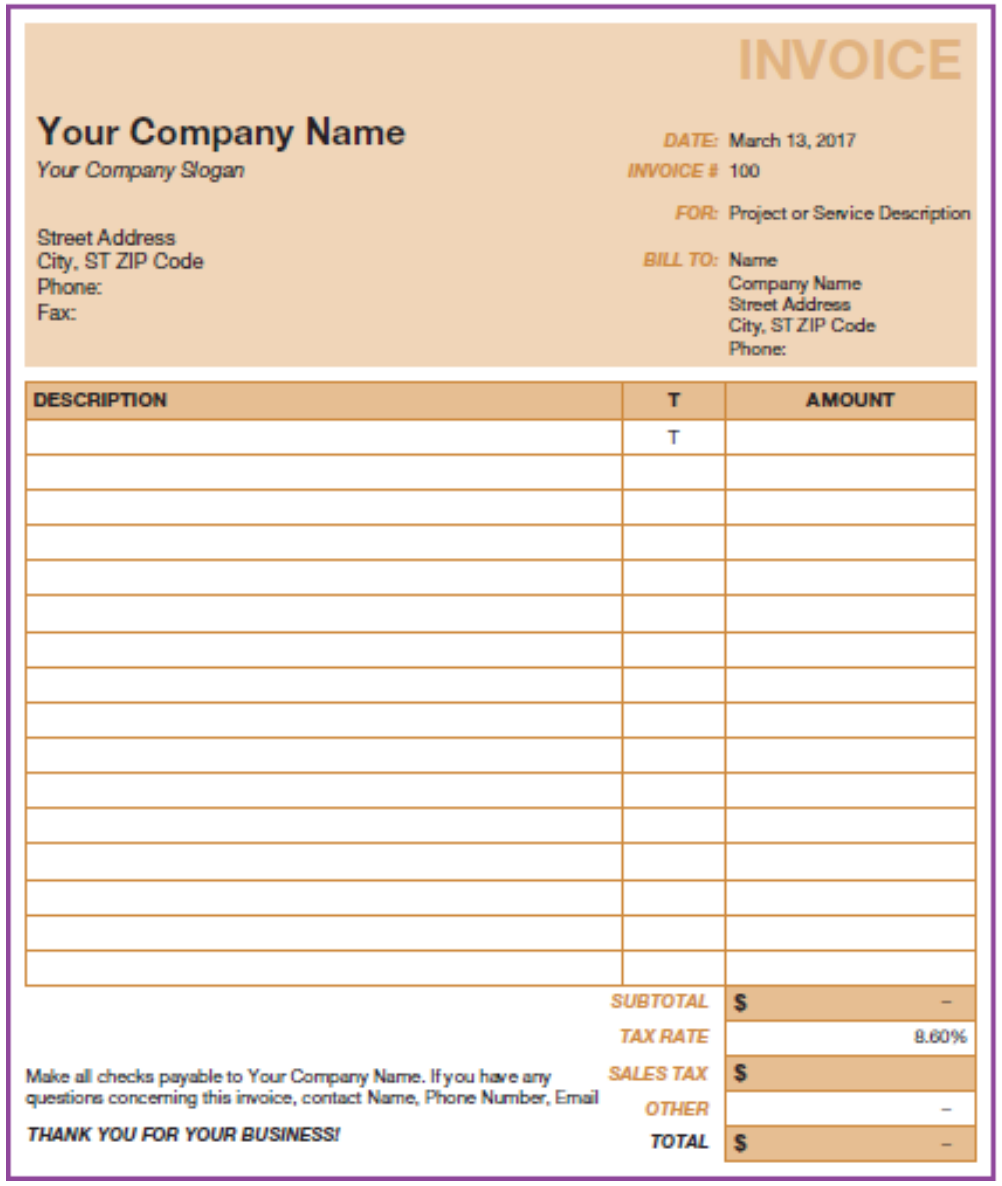
2- Business form

- Explicitly indicate ***data flow in*** or ***out*** of a system

3- Report

- Enables the analyst to work backwards from the report to the data that generated it

4- Description of current information system



INVOICE

Your Company Name

Your Company Slogan

Street Address
City, ST ZIP Code
Phone:
Fax:

DATE: March 13, 2017
INVOICE # 100
FOR: Project or Service Description

BILL TO: Name
Company Name
Street Address
City, ST ZIP Code
Phone:

DESCRIPTION	T	AMOUNT
	T	

SUBTOTAL	$ -
TAX RATE	8.60%
SALES TAX	$
OTHER	-
TOTAL	$ -

Make all checks payable to Your Company Name. If you have any questions concerning this invoice, contact Name, Phone Number, Email

THANK YOU FOR YOUR BUSINESS!

Business form is a **document** that contains useful information regarding **data organizations** and **possible screen layouts.**

Analyzing Procedures and Other Documents (cont.)

- Four types of useful documents

1- Written work procedures

- Describes how a job is performed
- Includes data and information used and created in the process of performing the job or task

2- Business form

- Explicitly indicate data flow in or out of a system

3- Report

- Enables the analyst to work ***backwards*** from the ***report*** to the ***data*** that generated it

4- Description of current information system

- Flow Charts, Data dictionaries, CASE tool reports, etc….

Analyzing Procedures and Other Documents (cont.)

- Four types of useful documents

1- Written work procedures

- Describes how a job is performed
- Includes data and information used and created in the process of performing the job or task

2- Business form

- Explicitly indicate data flow in or out of a system

3- Report

- Enables the analyst to work ***backwards*** from the ***report*** to the ***data*** that generated it

4- Description of current information system

- Flow Charts, Data dictionaries, CASE tool reports, etc….

Modern Methods for Determining Requirements

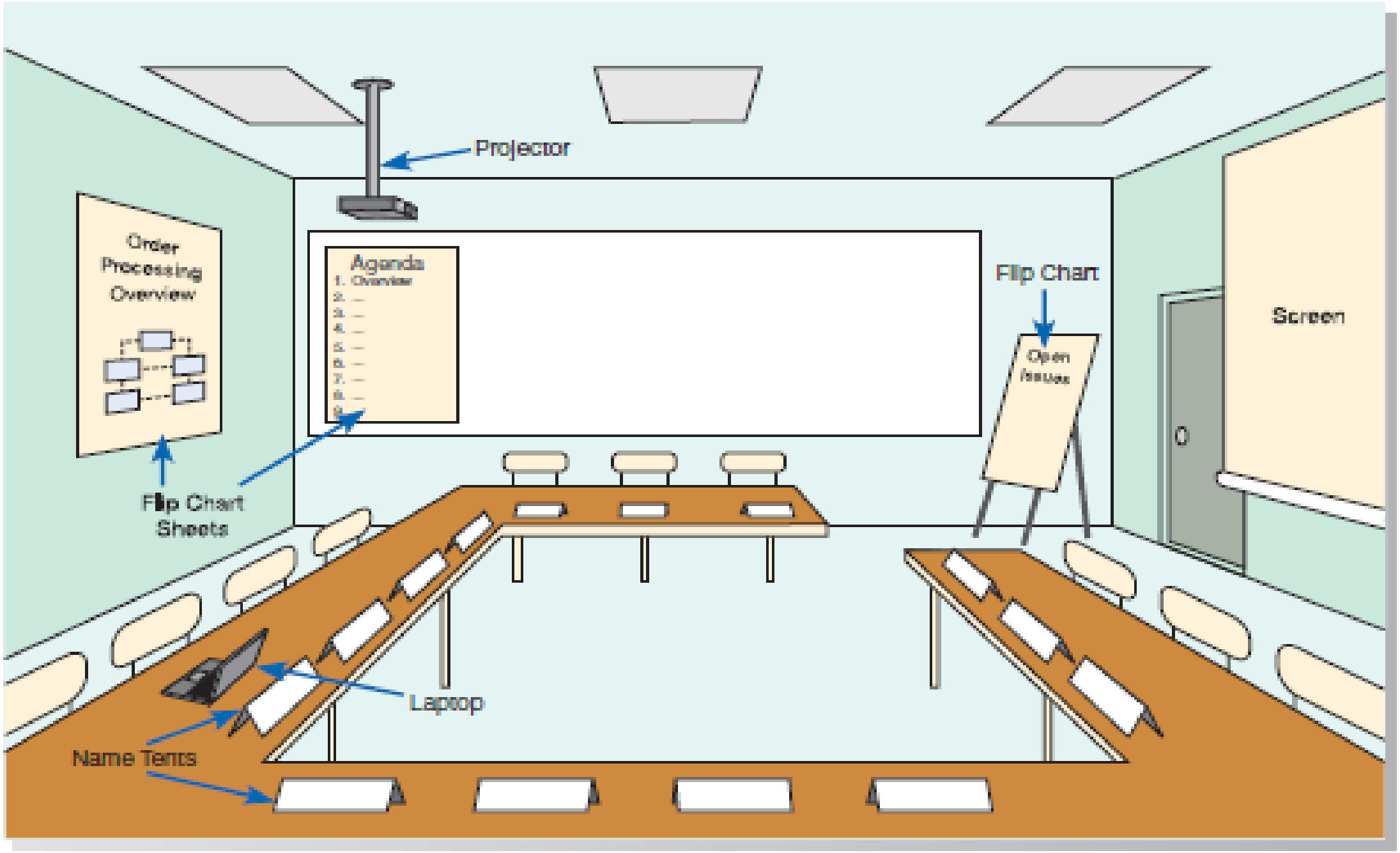
- Joint Application Design (JAD)
  - Brings together key users, managers, and systems analysts
  - Purpose: collect system requirements simultaneously from key people
  - Conducted off-site
- CASE tools
  - Used to analyze existing systems
  - Help discover requirements to meet changing business conditions
  - Rational rose, Visio, etc..
- Prototypes
  - Iterative development process
  - Basic working version of system is built
  - Refine understanding of system requirements in concrete terms

Joint Application Design (JAD)

- ***Intensive group-oriented*** requirements determination technique
- Purpose of JAD is to collect systems requirements ***simultaneously*** from the ***key people*** involved with the system (users, managers, and systems analysts).
- ***Team members meet in isolation*** for an extended ***period of time***.
- Usually conducted at a **location** other than the place where the people involved normally work.
- Highly focused
- The result is an ***intense*** and ***structured***, but ***highly effective process***.
- Allows you the ***opportunity*** to ***resolve conflicts***, or at least to ***understand why a conflict may not be simple to resolve***.

JAD Participants

- Session Leader: facilitates group process (group management, set agenda, neutral, resolving conflicts and disagreements)
- Users: active, speaking participants
- Managers: active, speaking participants
- Sponsor: high-level champion, limited participation
- Systems Analysts: should mostly listen
- Scribe: record session activities (word processor, CASE tool)
- IS Staff: should mostly listen


Projector
Order Processing Overview
Agenda
1. Overview
2. ...
3. ...
4. ...
5. ...
6. ...
7. ...
8. ...
9. ...
Flip Chart
Open Issues
Screen
Flip Chart Sheets
Laptop
Name Tents

Joint Application Design (cont.)

- End Result
  - **Documentation** detailing **existing system**
  - **Features** of **proposed system**

- CASE Tools During JAD
  - CASE tools are used
  - Enables analysts to enter system models directly into CASE during the JAD session
  - Screen designs and prototyping can be done during JAD and shown to users

Prototyping

- Is used to ***elicit*** and ***validate*** stakeholder needs through an ***iterative process*** that ***creates a model*** or ***design*** of ***requirements***.
- It is also used to ***optimize user experience***, to ***evaluate design options***, and as a basis for development of the final business solution.
- Quickly ***converts requirements*** to ***working version*** of system.
- Once the user sees requirements converted to system, will ask for ***modifications*** or will ***generate additional requests***

Prototyping (cont.)

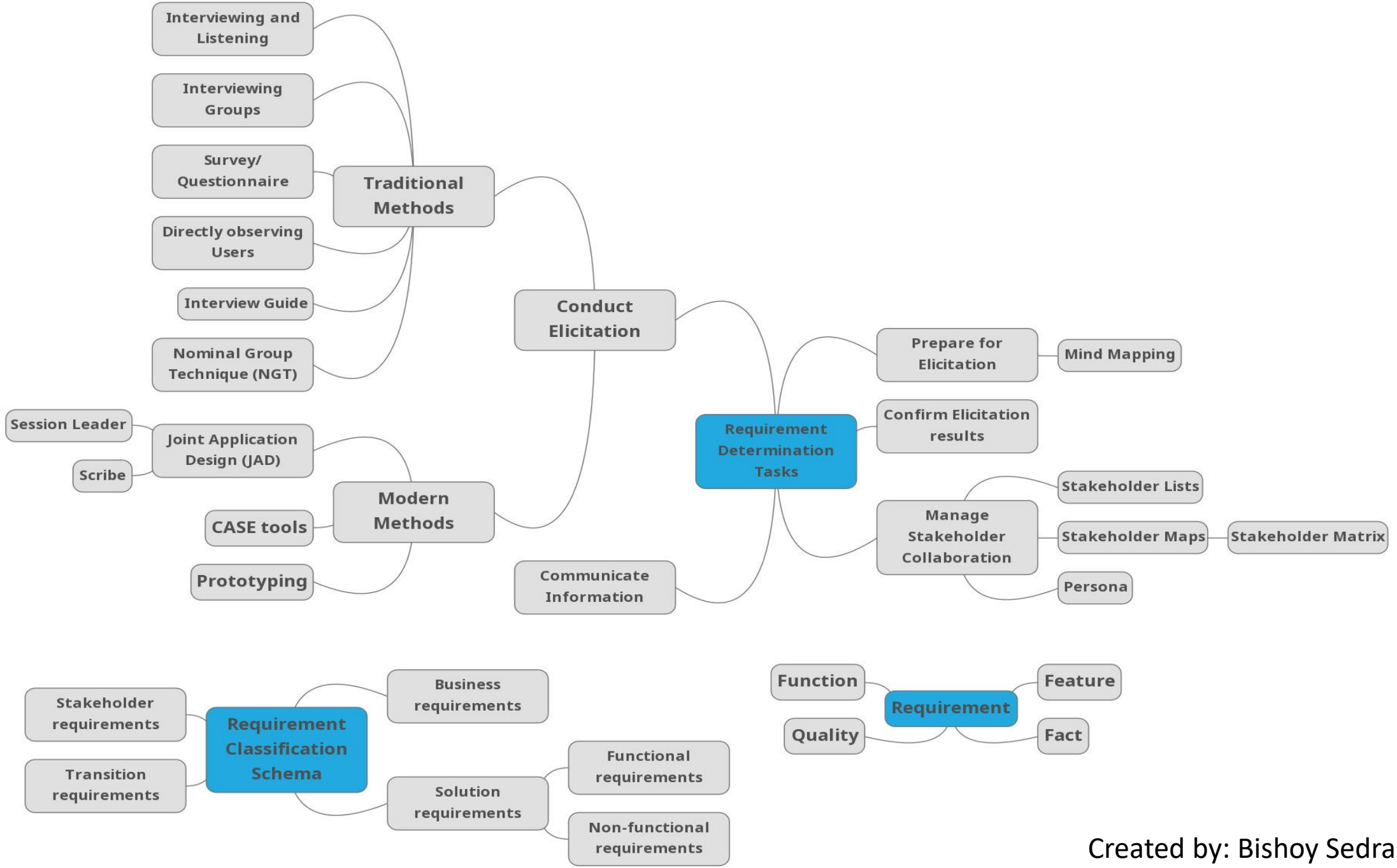
- Most useful when:
  - ***User requests*** are not ***clear***
  - ***Few users*** are ***involved*** in the system
  - ***Designs*** are ***complex*** and require ***concrete form***
  - Provides a ***visual representation*** for the ***future state***.
  - Allows providing ***input\feedback early*** in the ***design process***.
  - When using ***throw-away*** or ***paper prototyping*** methods, users may ***feel*** more ***comfortable*** being critical of the mock-up because it is not polished and release-ready.
  - ***History of communication problems*** between ***analysts*** and ***users***
  - ***Tools*** are ***readily available*** to build prototype

Prototyping (cont.)

- Drawbacks
  - ***Difficult*** to ***adapt*** to more ***general*** user audience.
  - ***Technology*** need to be ***understood*** to ***initiate prototyping***.
  - ***Unrealistic expectations*** for the ***final solution***.
  - ***Higher expectations*** of ***performance***, ***reliability***, and ***usability***.
  - Focus on the ***design specifications*** of the solution rather than the non-functional *requirements*.

Deliverables of Requirements Determination

- From interviews and ethnography
  - Interview transcripts, observation notes, meeting minutes
- From existing written documents
  - Mission and strategy statements, business forms, procedure manuals, job descriptions, training manuals, system documentation, flowcharts
- From computerized sources
  - JAD session results, CASE repositories, system prototype displays and reports



Created by: Bishoy Sedra

Which requirements elicitation technique includes observing the users work in their own environment?

Elaborate on the advantages of using open-ended questions in the interview process

Which requirements elicitation technique works best to obtain quantitative data for statistical analysis ?

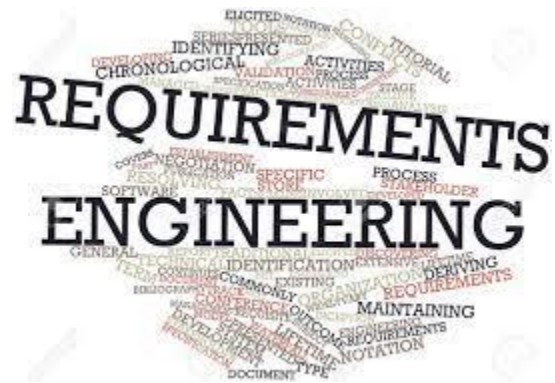
List three modern requirements determination techniques

When do business analysts use prototypes?

References

- Modern System analysis and Design, **Fourth Edition, Joseph S. ValacichJoey F. GeorgeJeffrey A. HofferLecture**

- BABOK, A Guide to the Business Analysis Body Of Knowledge, International Institute of Business Analysis IIBA.


REQUIREMENTS
ENGINEERING
ELICITED
IDENTIFYING
CHRONOLOGICAL
ACTIVITIES
TUTORIAL
NEGOTIATION
SPECIFIC
PROCESS
SOFTWARE
STAKEHOLDER
GENERAL
IDENTIFICATION
DERIVING
REQUIREMENTS
MAINTAINING
COMMONLY
EXISTING
LIFETIME
NOTATION
DOCUMENT
TYPE