ISYS2110
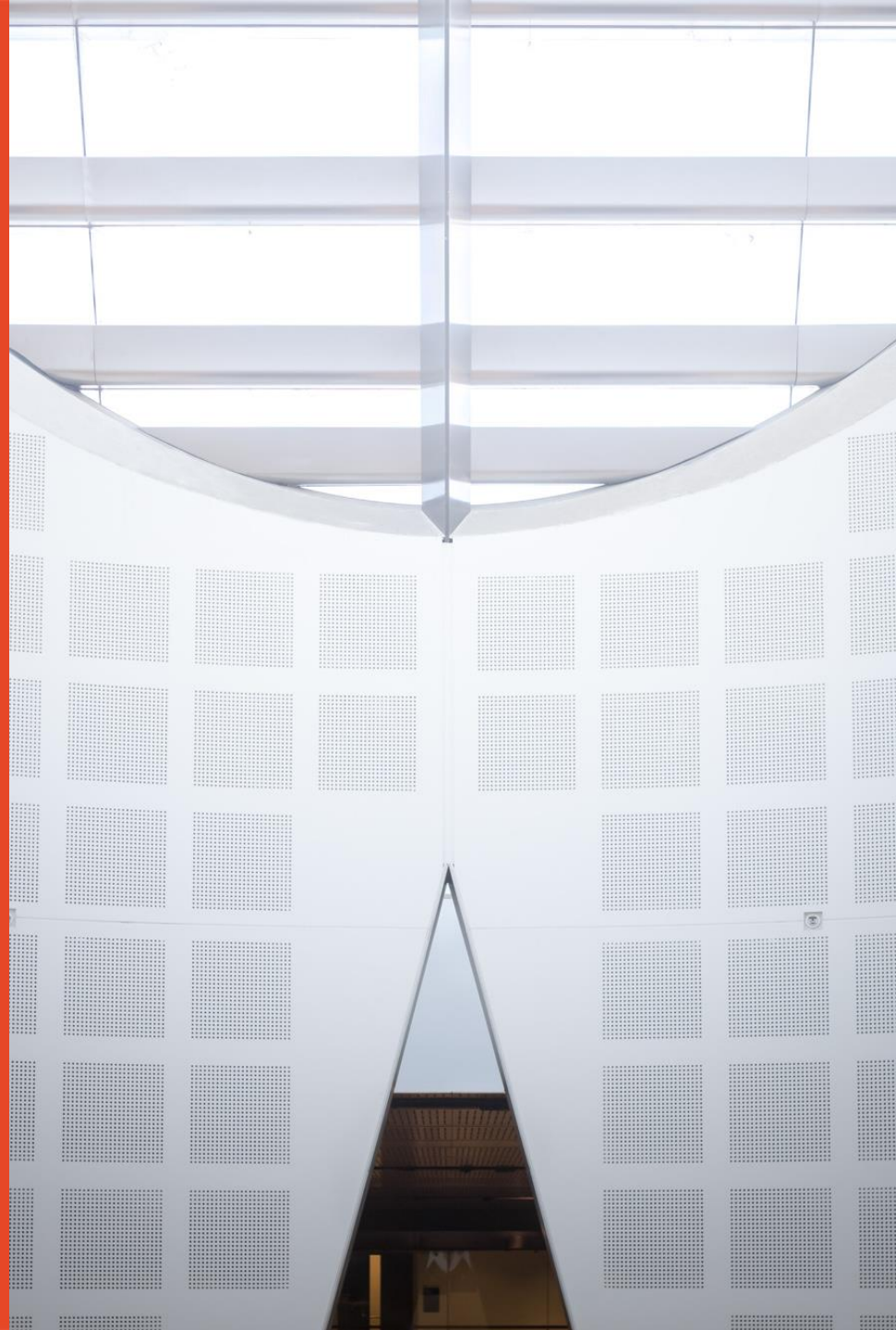# Analysis and Design of Web Information Systems

Lecture 2
Investigating System Requirements

Semester 1, 2018

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SYDNEY

Recapture From Lecture 1

What we have covered last week on the topic:

Introduction to Systems Analysis and Design

- Understanding today's Business

- Information Systems, IS Components

- Type of information needed by users

- Systems Development Life Cycle (SDLC)

- Systems Development Methods

- Roles, Skills, Knowledge, and Career of Systems Analyst

Where Are We Now ? -- Course map

Week	Topics/Activities
Week 1	Introduction to Systems Analysis and Design
Week 2	Investigating System Requirements
Week 3	Managing System Projects
Week 4	Public Holiday (no class)
Week 5	Requirement Modelling
	Assessment Due: Assignment 1
Week 6	Data and Process Modelling
	Assessment Due: Quiz 1
Week 7	Object Modelling
Week 8	User Interface Design
Week 9	Data Design
	Assessment Due: Quiz 2
Week 10	System Architecture Design
Week 11	System Implementation
Week 12	Documentation and Systems Support
	Assessment Due: Assignment 2
Week 13	Review
Exam Period	Assessment Due: Final Exam

What Will We Do Today ?

- Lecture
  - Business and Systems requirements
  - Systems feasibility
  - Requirement investigation techniques
  - System requirements prioritization

- Class activities
  - Critical Thinking / No Problem Solving Today
  - https://padlet.com
  - https://answergarden.ch
- Tutorial: How is it going?
- Assessment
  - Assignment 1: Due week 5
- Announcement (if any):

Learning Objectives

- Understand the concept of a business case and how it affects systems project
- Describe systems requests and the role of the systems review committee

- Understand why investigating requirements
- Discuss operational, technical, economic, and schedule feasibility

- Describe the steps of a preliminary investigation of requirements
- Discuss requirements prioritization – factors and techniques

Understanding Business Case

- **Business case:** Justification for a proposal, aligned to organizational missions, objectives and IT needs.

- Why business case?
- Any relation between

    "Systems projects and business/organization"?

- Where the organization is at present, where they want to be?

- A business case should:

    – Be comprehensive and easy to understand

    – Describe the project clearly, provide the justification to proceed, and estimate the project's financial impact

Understanding Business Case

- Questions answered by a business case
  - Why are we doing this project?
  - How much will it cost and how long will it take?
  - Are there any risks involved?
  - How will we measure success?
  - What alternatives exist?

Systems Development Request
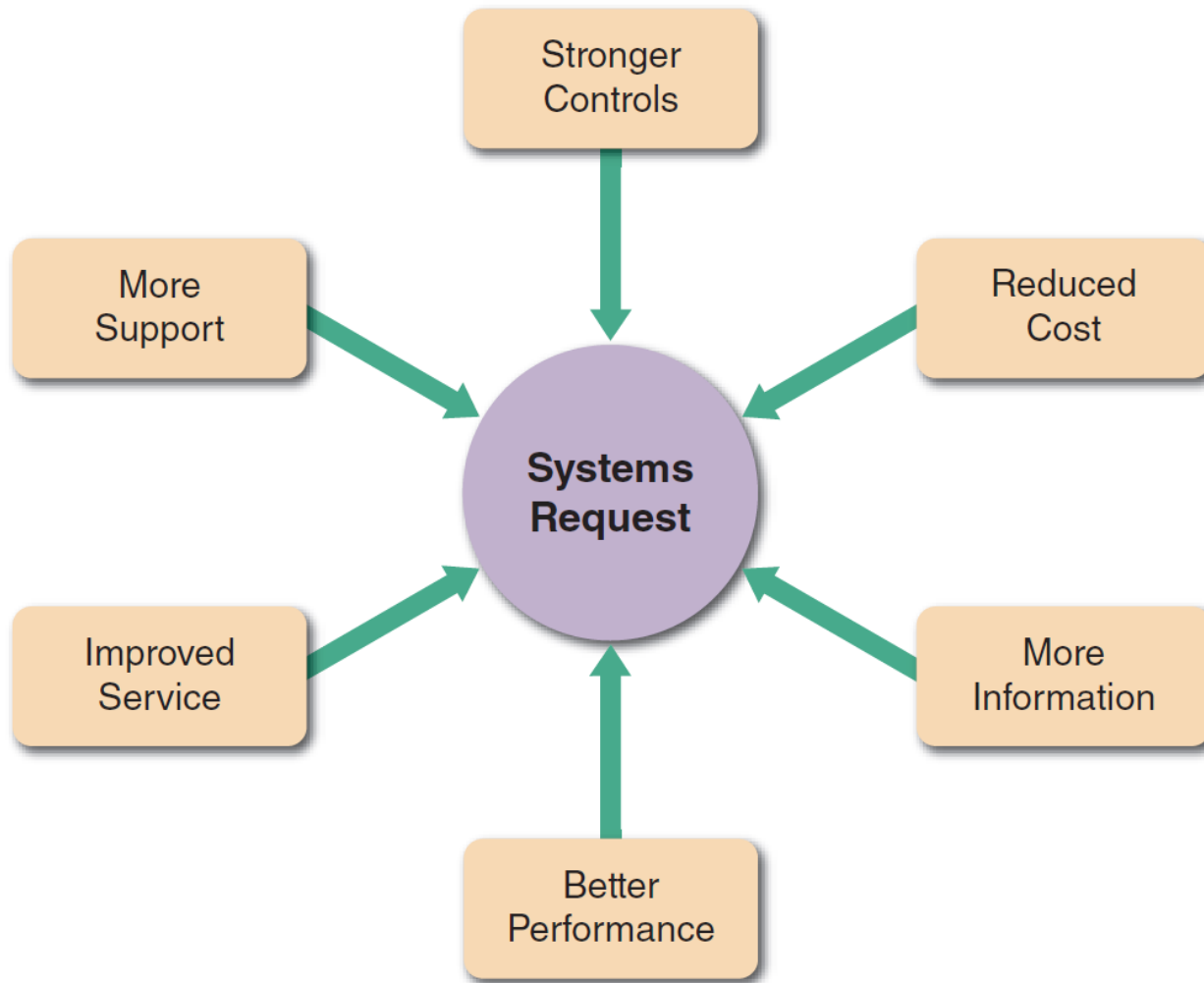
Six main reasons for systems requests.

Why Investigating Requirements?

Source: goo.gl/GrxPy8
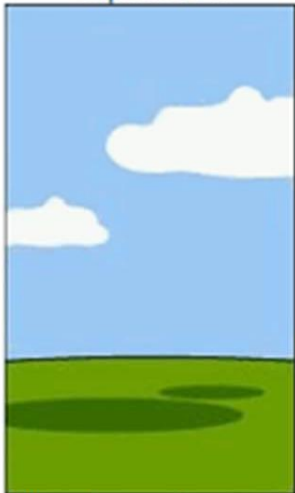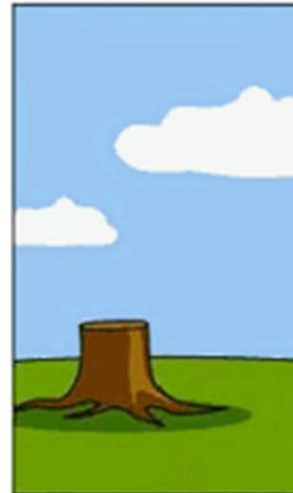
What Are Requirements?

- System Requirements
  - Functional requirements
  - Non-functional requirements
- Functional Requirements– the activities the system must perform
  - Business uses, functions the users carry out
  - Shown as use cases
- Non-Functional Requirements– other system characteristics
  - Constraints and performance goals

FURPS Requirements Acronym

- **F**unctional requirements

- **U**sability requirements

- **R**eliability requirements

- **P**erformance requirements

- **S**ecurity requirements

Functional and Nonfunctional Requirements

Requirement categories	FURPS categories	Example requirements
Functional	Functions	Business rules and processes
Nonfunctional	Usability Reliability Performance Security	User interface, ease of use Failure rate, recovery methods Response time, throughput Access controls, encryption

Additional Requirements Categories

- Design constraints –
  - Specific restrictions for hardware and software
- Implementation requirements
  - Specific languages, tools, protocols, etc.
- Interface requirements
  - Interface links to other systems
- Physical requirements
  - Physical facilities and equipment constraints
- Supportability requirements
  - Automatic updates and enhancement methods

Evaluation of Systems Requirements

- Systems requests are evaluated by a **systems review committee** or a **computer** re**sources committee**
- **Systems Request Forms**

  - Streamline the request process
  - Ensure consistency
  - Easy to understand
  - Include clear instructions
  - Indicate the required supporting documents
  - Submitted electronically

Evaluation of Systems Requirements (Cont. 1)

Example of an online systems request form.
Source: Florida Institute of Technology

Evaluation of Systems Requirements (Cont. 2)

- **Systems Review Committee**
  - A broader viewpoint enables a committee to establish priorities more effectively than an individual
    - One person's bias is less likely to affect decisions
  - Disadvantages
    - Action on requests must wait until the committee meets
    - Members might favor projects requested by their own departments
    - Internal political differences could delay important decisions

Class Discussion 1

With the advantages and disadvantages of using a systems review committee in mind, (a) when it is better for systems requests to be reviewed by a committee. Discuss with your friends.

Please identify and write your answer at

https://padlet.com/rabiul_hasan/

Class Discussion 2

With the advantages and disadvantages of using a systems review committee in mind, (b) when requests are better reviewed by an individual. Discuss with your friends.

Please identify and write your answer at

https://padlet.com/rabiul_hasan/

Class Discussion 3

When evaluating a systems request, (a) **what criteria should be applied** and (b) how should priorities be determined? Discuss with your friends.

- Please submit answer at AnswerGarden:

    share ONE WORD ONLY

    https://answergarden.ch/

Overview of Feasibility

- Feasibility studies can be simple or exhaustive

- Effort required depends on the nature of the request

- Initial fact-finding involves:
    - Studying organizational charts

    - Performing interviews

    - Reviewing current documentation

    - Observing operations

    - Surveying users

Overview of Feasibility (Cont. 1)
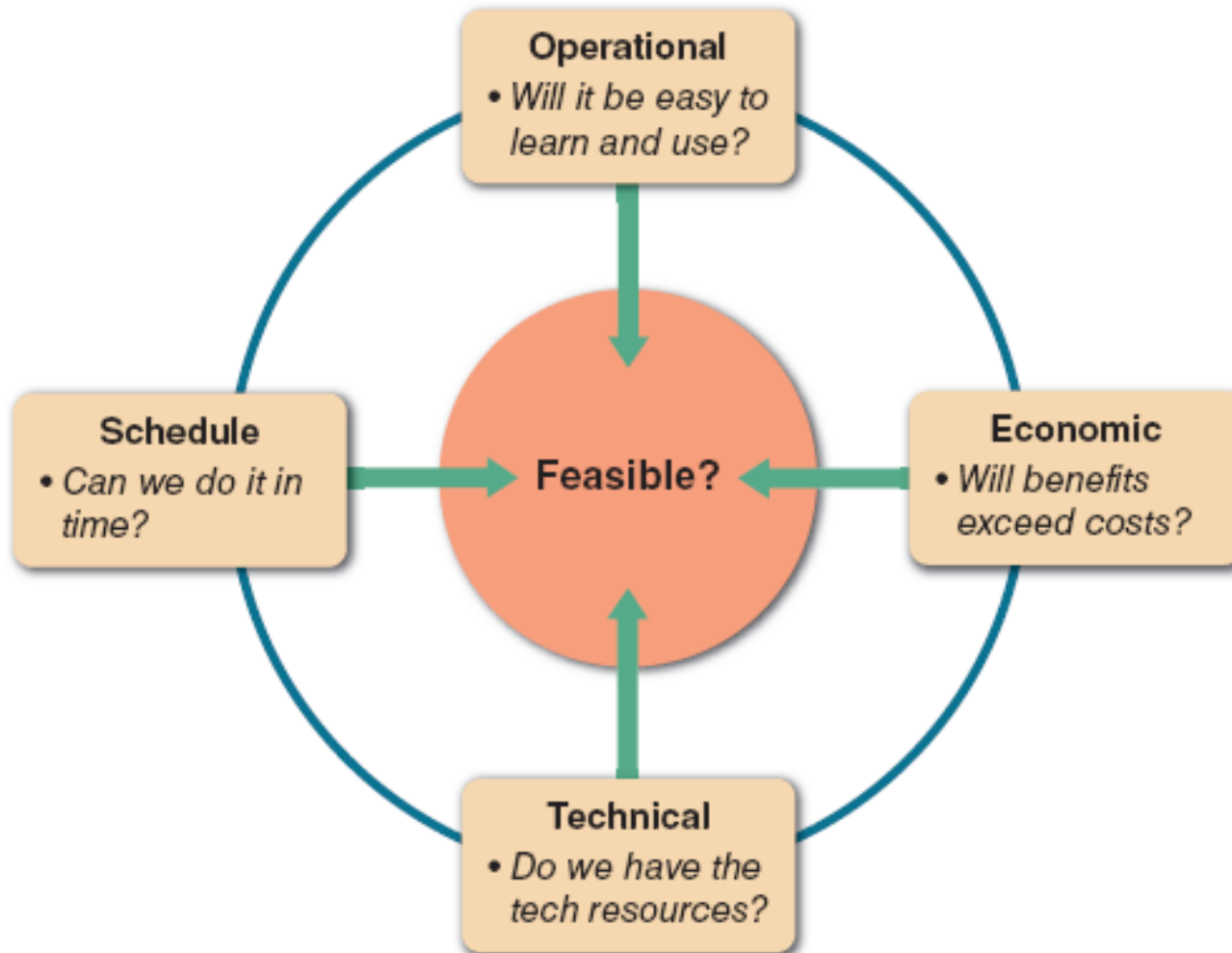
A feasibility study examines operational, technical, economic, and schedule factors.

Overview of Feasibility (Cont. 2)

- **Operational Feasibility**
  - A proposed system will be used effectively after it has been developed
  - Can be affected by organizational culture
  - Cannot be accurately measured but requires careful study
  - Questions that can help predict a system's operational feasibility
    - Is the project supported by management and users?
    - Will the new system result in a workforce reduction?
    - Do legal or ethical issues need to be considered?

Overview of Feasibility (Cont. 3)

- **Economic Feasibility**
  - Projected benefits of a proposed system out-weigh **total cost of ownership (TCO)**
  - Determination of TCO requires cost analysis of:
    - People, including IT staff and users
    - Hardware and equipment
    - Software
    - Formal and informal training
    - Licenses and fees
    - Consulting expenses
    - Facility costs

Overview of Feasibility (Cont. 4)

- **Tangible costs** are measured in dollars
- **Intangible costs** can significantly affect organizational performance

- **Tangible benefits** can result from a decrease in expenses or an increase in revenues
- **Intangible benefits** are important to the company despite the inability to measure them in dollars

Overview of Feasibility (Cont. 5)

- **Technical Feasibility**
  - Technical resources required to acquire and use the system
  - Questions analysts should ask
    - Does the company have the necessary hardware, software, and network resources?
    - Does the company have the required technical expertise?
    - Does the proposed platform have sufficient capacity for future needs?
    - Will a prototype be required?

Overview of Feasibility (Cont. 6)

- **Schedule Feasibility**
  - A project can be implemented in an acceptable time frame
  - Issues that can affect schedule feasibility
    - Interaction between time and costs
    - Can the company or the IT team control the factors that affect schedule feasibility?
    - Has management established a firm timetable for the project?
    - What conditions must be satisfied during the development of the system?
    - Will an accelerated schedule pose any risks?

Evaluating Feasibility

- Identify and weed out systems requests that are not feasible

- Requests that are not currently feasible can be resubmitted as new hardware, software, or expertise becomes available

Preparing for Requirement Investigation

- **Interaction with Stakeholders**
  - Meet with key managers, users, and IT staff to describe the project, explain responsibilities, answer questions, and invite comments
  - Focus on improvements and enhancements, not problems

Stakeholders -- Who do you involve and talk to?

- **Stakeholders**– persons who have an interest in the successful implementation of the system
  - **Internal Stakeholders**– persons within the organization
  - **External stakeholders** – persons outside the organization
  - **Operational stakeholders** – persons who regularly interact with the system
  - **Executive stakeholders**– persons who don't directly interact, but use the information or have financial interest

Stakeholders -- Who do you involve and talk to?(Cont..)

	Operational	Executive
Internal	Bookkeepers Accountants Operational managers Internal auditors	Senior managers Board of directors
External	Partner organizations External auditors Customers	Investors Regulators
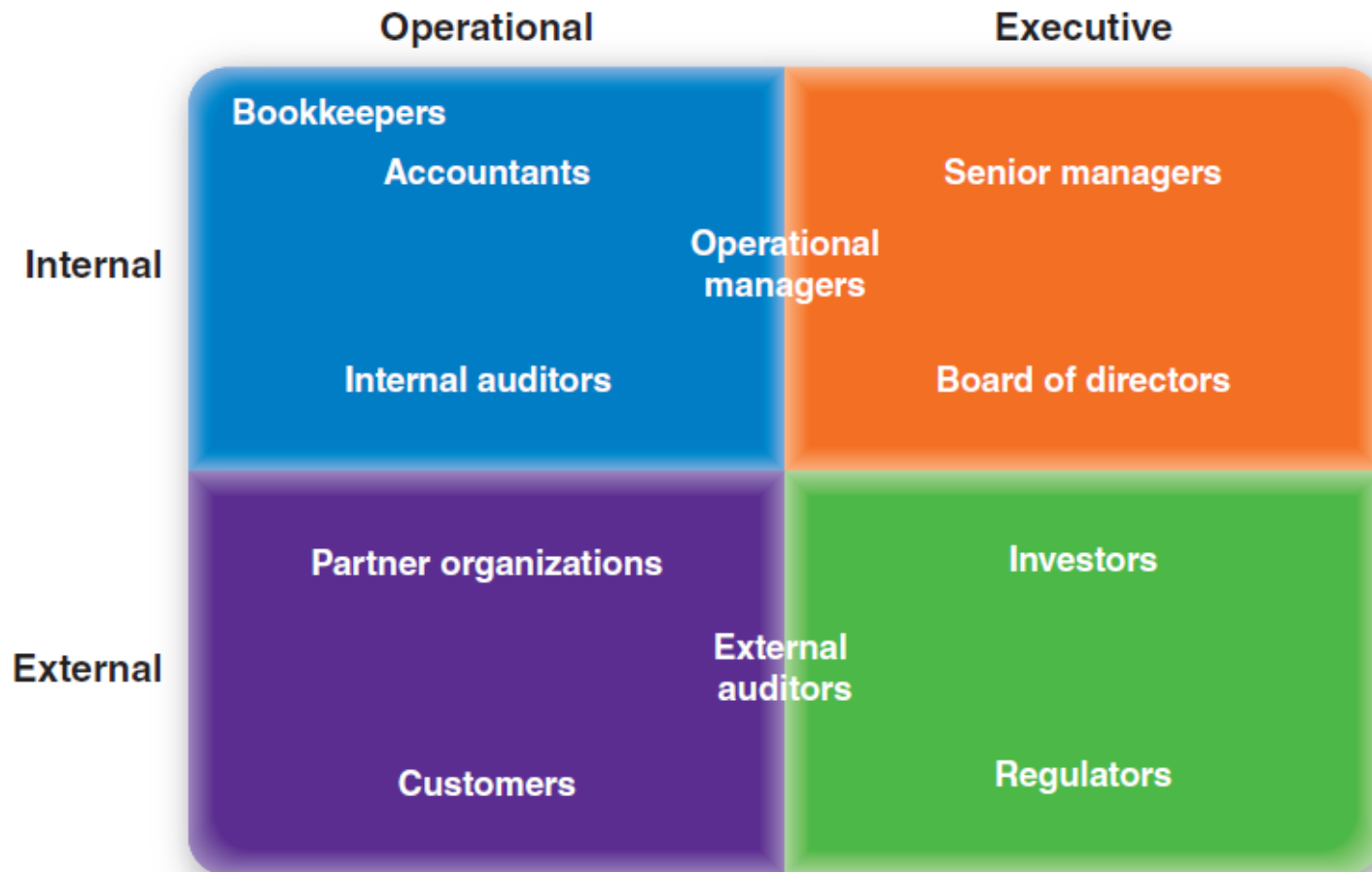
Stakeholders -- How do you communicate with ?

- Communication strategy for specific type of stakeholders

Preliminary Investigation

Model of a preliminary investigation. Notice the importance of fact-finding in each of the four areas.

1 Understand the problem or opportunity

2 Define the project scope and constraints

3 Perform fact-finding
- Analyze organization charts
- Review documentation
- Observe operations
- Conduct a user survey

4 Study usability, cost, benefit, and schedule data

5 Evaluate feasibility
- Operational
- Technical
- Economic
- Schedule

6 Present recommendations to management

Six main steps in a typical preliminary investigation.

Preliminary Investigation Overview (Cont. 2)

- **Planning the Preliminary Investigation**
  - **Step 1- Understand the problem or opportunity**

    - Develop a business profile that describes current business processes and functions
    - Understand how modifications will affect business operations and other information systems
    - Identify the departments, users, and business processes involved
    - Consider using a **fishbone diagram**

Preliminary Investigation Overview (Cont. 3)
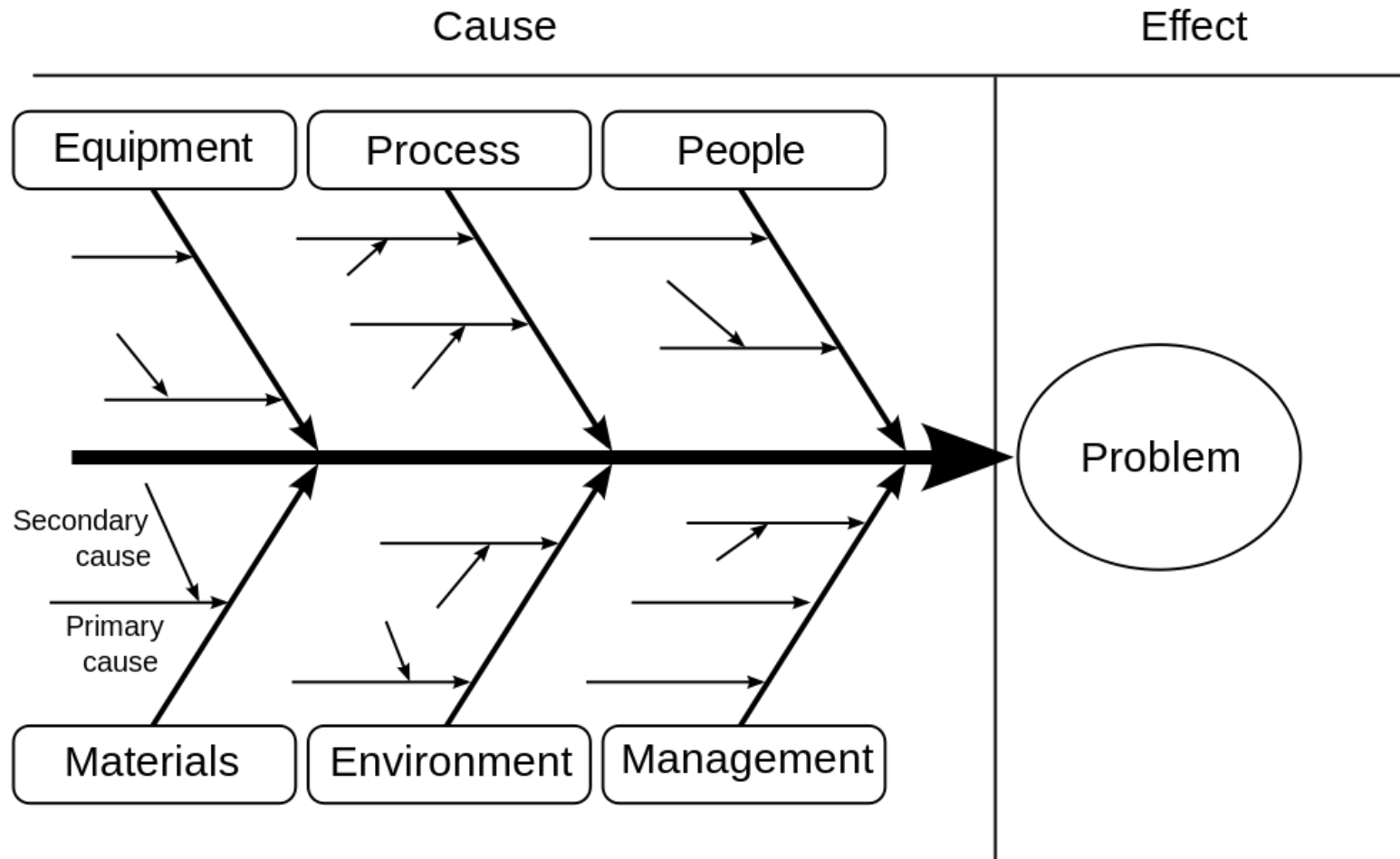
A fishbone diagram displays the causes of a problem. Typically, you must dig deeper to identify actual causes rather than just symptoms.

Image Source: https://commons.wikimedia.org/wiki/File:Ishikawa_Fishbone_Diagram.svg

Preliminary Investigation Overview (Cont. 4)

- **Planning the Preliminary Investigation** (Cont.)
  - **Step 2 - Define the project scope and constraints**

    - Define the specific boundaries, or extent, of the project
    - Define project scope by creating a list with sections called must do, should do, could do, and won't do
    - Avoid project creep
      - **Project creep**: Process by which projects with very general scope definitions expand gradually, without specific authorization
    - Identify constraints
      - **Constraint**: A requirement or condition that the system must satisfy or an outcome that the system must achieve

Preliminary Investigation Overview (Cont. 5)

- **Planning the Preliminary Investigation (Cont.)**

    - **Step 3 – Perform fact-finding,** there are many techniques:
        a) **Gather and analyze data**
        b) **Analyze organization charts**

        c) **Conduct interviews**
        d) **Review documentation**

        e) **Observe operations**
        f) **Conduct a user survey**
        g) **Joint Application Development**

(a) Gather and Analyze Data

- About project usability, costs, benefits, and schedules
- Pareto chart, XY chart (scatter diagram)
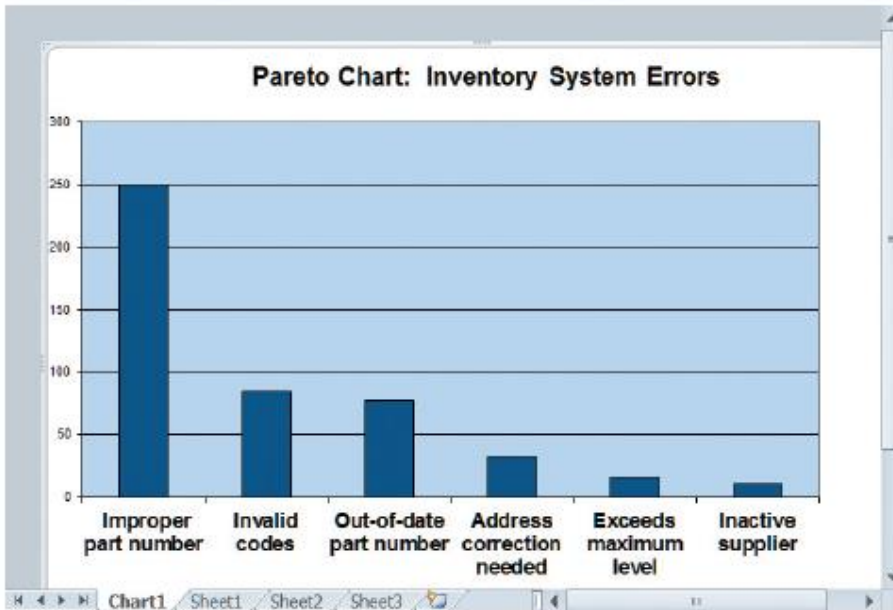
A Pareto chart displays the causes of a problem, in priority order, so an analyst can tackle the most important causes first. In this example, the part number issue would be the obvious starting point.
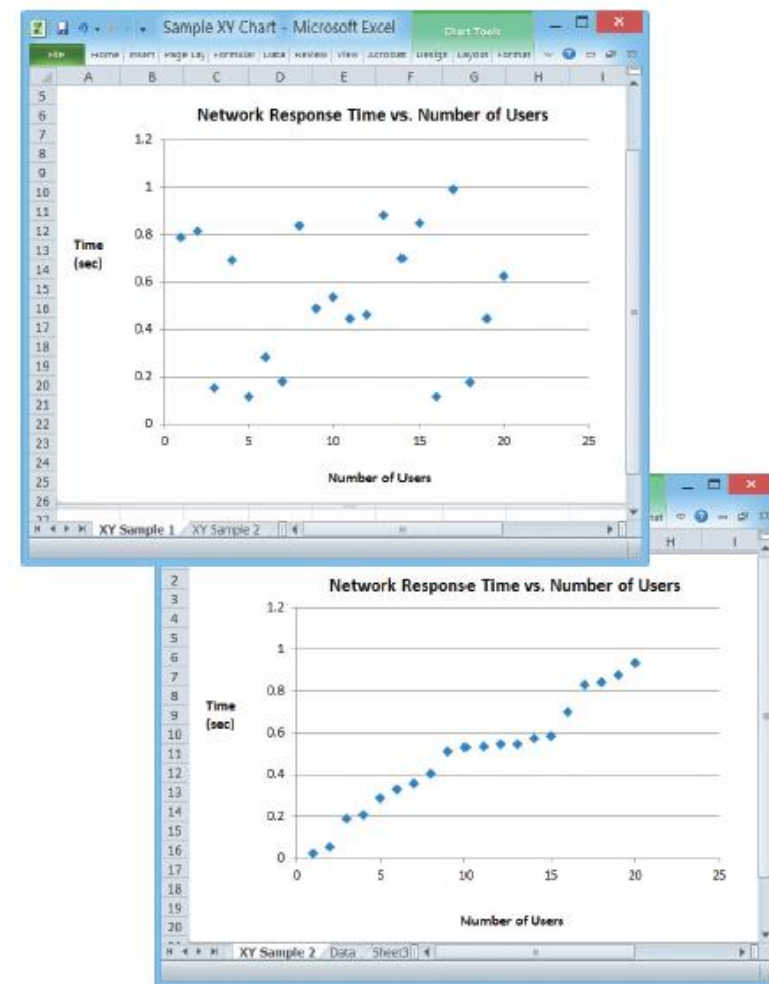
An XY chart shows correlation between variables, which is very important in problem solving. Conversely, a *lack* of correlation suggests that the variables are independent, and that you should look elsewhere for the cause.

(b) Analyze Organization Charts

- Why?

(c) Conduct Interviews -- Five Basic Steps

Select interviewees

Design interview questions

Prepare for the interview

Conduct the interview

Post-interview follow-up

Adapted from: Vera and Colleagues, 2017
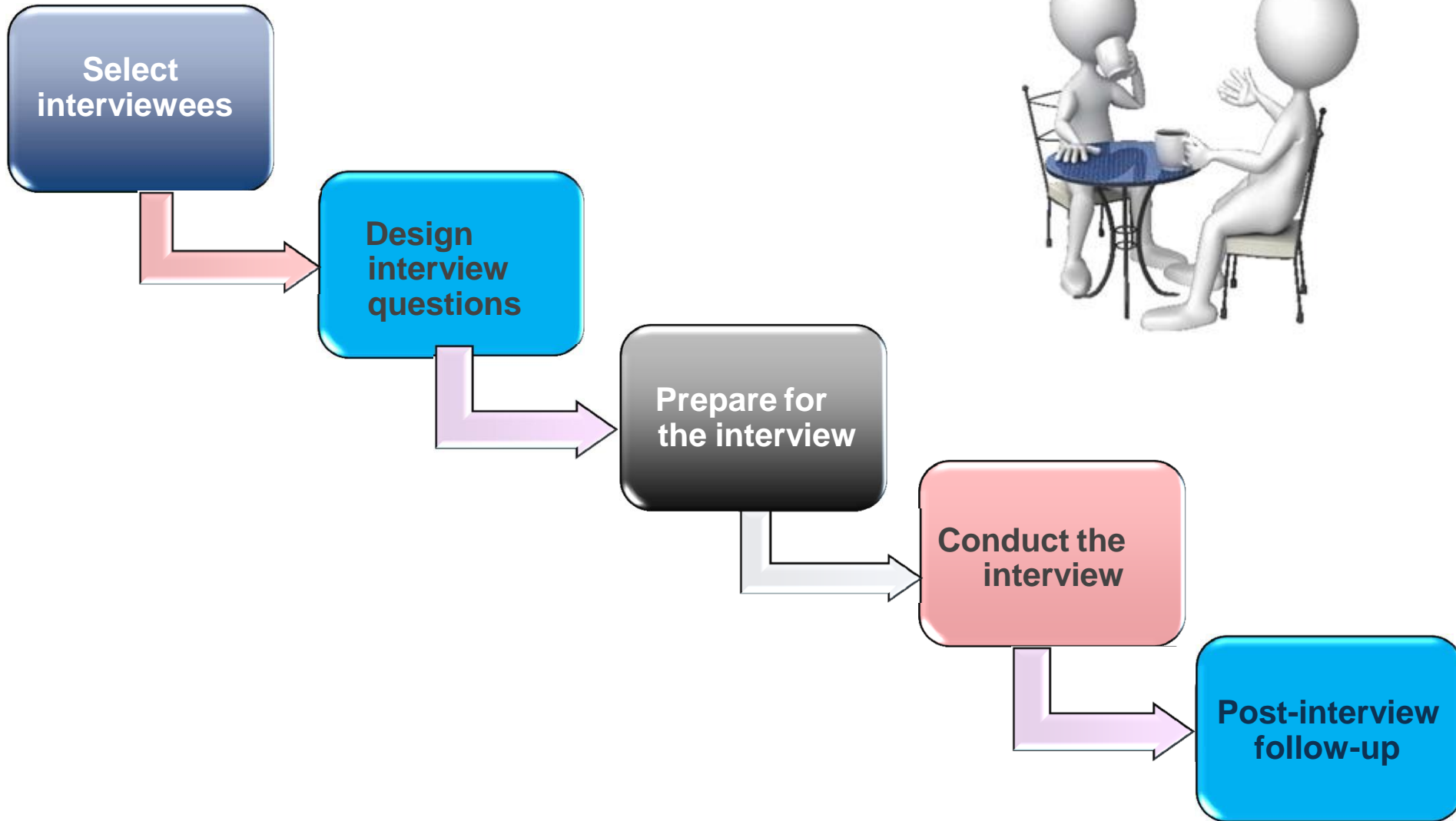
(c) Conduct Interviews – Select Interviewees

- Based on information needed
- Good to have different level of stakeholder participation

  - Managers

  - Users

  - All key stakeholders

(c) Conduct Interviews – Design Interview Questions

Theme	Questions to users
What are the business operations and processes?	What do you do?
How should those operations be performed?	How do you do it? What steps do you follow? How could they be done differently?
What information is needed to perform those operations?	What information do you use? What inputs do you use? What outputs do you produce?

(c) Conduct Interviews – Design Interview Questions

Types of Questions	Examples
Closed-Ended Questions	• How many telephone orders are received per day? • How do customers place orders? • What information is missing from the monthly sales report?
Open-Ended Questions	• What do you think about the way invoices are currently processed? • What are some of the problems you face on a daily basis? • What are some of the improvements you would like to see in the way invoices are processed?
Probing Questions	• Why? • Can you give me an example? • Can you explain that in a bit more detail?

Critical Thinking Exercise 1:

Why an interview should include open-ended questions?

- What is an **advantage** of using open-ended questions?
- Please submit answer at AnswerGarden:

    share ONE WORD ONLY

    https://answergarden.ch/

Critical Thinking Exercise 2:
Why an interview should include open-ended questions?

- What is a possible **disadvantage**?
- Please submit answer at AnswerGarden:

  share ONE WORD ONLY

  https://answergarden.ch/

(c) Conduct Interviews – Preparation/Checklist

Before

☐ Establish the objective for the interview.

☐ Determine correct user(s) to be involved.

☐ Determine project team members to participate.

☐ Build a list of questions and issues to be discussed.

☐ Review related documents and materials.

☐ Set the time and location.

☐ Inform all participants of objective, time, and locations.

During

☐ Arrive on time.

☐ Look for exception and error conditions.

☐ Probe for details.

☐ Take thorough notes.

☐ Identify and document unanswered items or open questions.

After

☐ Review notes for accuracy, completeness, and understanding.

☐ Transfer information to appropriate models and documents.

☐ Identify areas needing further clarification.

☐ Thank the participants.

☐ Follow up on open and unanswered questions.

(c) Conduct Interviews – Strategies

High-level: very general

Medium-level: moderately specific

Low-level: very specific

Top-Down

Bottom-Up

How can order processing be improved?

How can we reduce the number of times that customers return items they've ordered?

How can we reduce the number of errors in order processing (e.g., shipping the wrong products)?
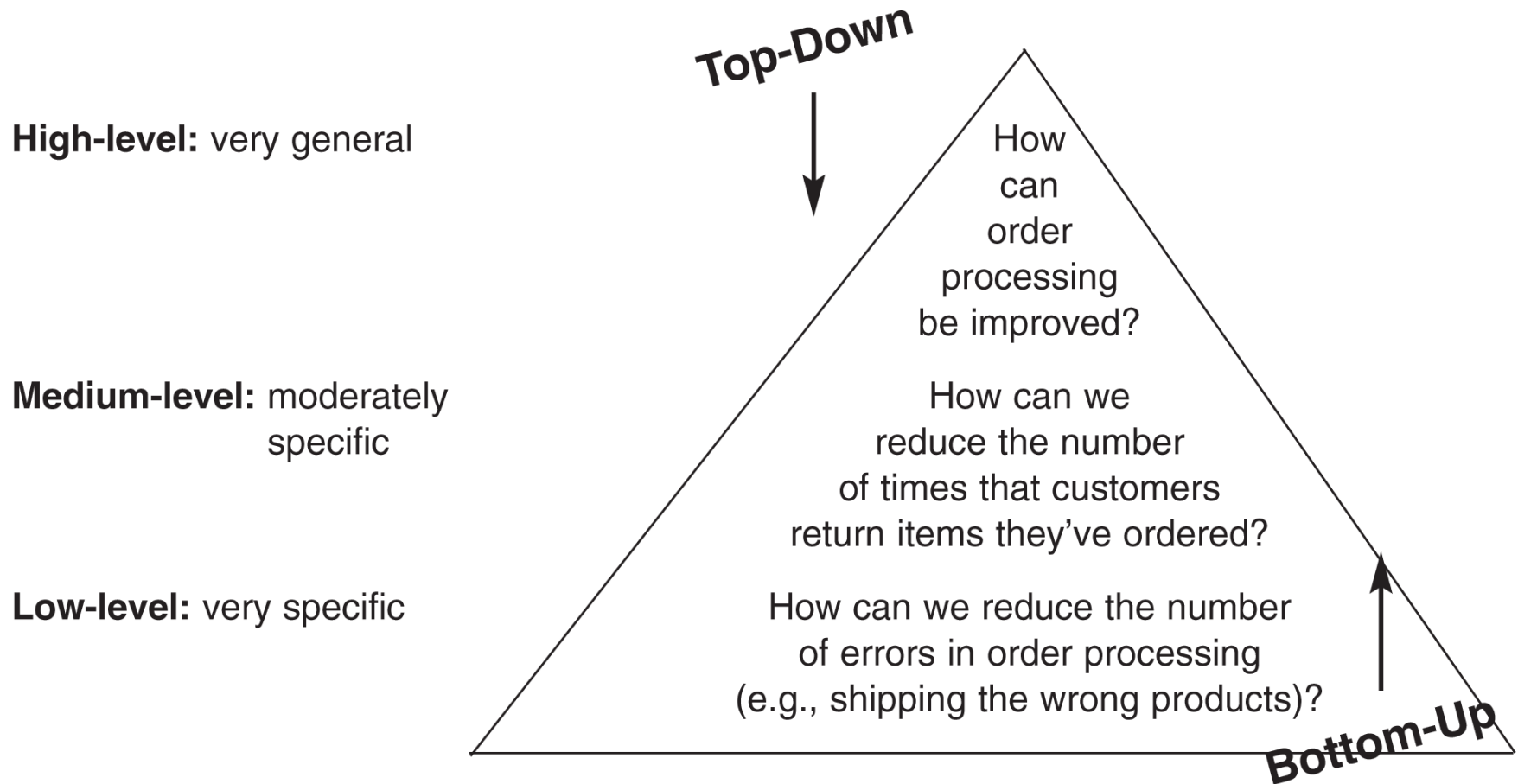
(c) Conduct Interviews – Managing the interview

- Interviewer should have a neutral, encouraging tone

- Allow subject to find their answer in their own words

  - Make sure that you don't convey disapproval or disagreement

- Avoid confrontation

- Seek clarification and confirmation

  - Especially by asking for similar information in different ways

- Politeness and courtesy matter

Adapted from: Vera and Colleagues, 2017

(d) Review Documentation

- Look at documents, forms etc used in the as-is system
- Also examine related documents form the organization
  - reports, data capture, web pages, policy manuals

- These can suggest types of information that must be gathered
- For each aspect of the information, there should be some requirement for which this is relevant

(e) Observe Operations

- How things are done in the organization
  - what, who, how?

(f) **Conduct User Survey–** Questionnaire Design

- Begin with non-threatening and interesting questions
- Group items into logically coherent sections

- No important items at the very end, put them earlier
- Do not crowd a page with too many items

- Avoid abbreviations
- Avoid biased or suggestive items or terms

- Number questions to avoid confusion
- Pretest to identify confusing questions
- Provide anonymity to respondents

Adapted from: Vera and Colleagues, 2017

(f) Conduct User Survey

– Questionnaire Design

RMO Questionnaire

This questionnaire is being sent to all telephone-order sales personnel. As you know, RMO is developing a new customer support system for order taking and customer service.

The purpose of this questionnaire is to obtain preliminary information to assist in defining the requirements for the new system. Follow-up discussions will be held to permit everybody to elaborate on the system requirements.

Part I. Answer these questions based on a typical four-hour shift.
1. How many phone calls do you receive?_____
2. How many phone calls are necessary to place an order for a product?_____
3. How many phone calls are for information about RMO products, that is, questions only?_____
4. Estimate how many times during a shift customers request items that are out of stock._____
5. Of those out-of-stock requests, what percentage of the time does the customer desire to put the item on back order?_____%
6. How many times does a customer try to order from an expired catalog?_____
7. How many times does a customer cancel an order in the middle of the conversation?_____
8. How many times does an order get denied due to bad credit?_____

Part II. Circle the appropriate number on the scale from 1 to 7 based on how strongly you agree or disagree with the statement.

Question	Strongly Agree						Strongly Disagree
It would help me do my job better to have longer descriptions of products available while talking to a customer.	1	2	3	4	5	6	7
It would help me do my job better if I had the past purchase history of the customer available.	1	2	3	4	5	6	7
I could provide better service to the customer if I had information about accessories that were appropriate for the items ordered.	1	2	3	4	5	6	7
The computer response time is slow and causes difficulties in responding to customer requests.	1	2	3	4	5	6	7

Part III. Please enter your opinions and comments.

Please briefly identify the problems with the current system that you would like to see resolved in a new system.
_____
_____
_____

Source: Satzinger, Jackson & Burd's Systems Analysis and Design in a Changing World, 7th Ed © 2016 by Cengage Learning US

(g) Joint Application Development

- Project team and various stakeholders work together, intensively over an extended period. Key stakeholders – **facilitator, scribe, participants.**
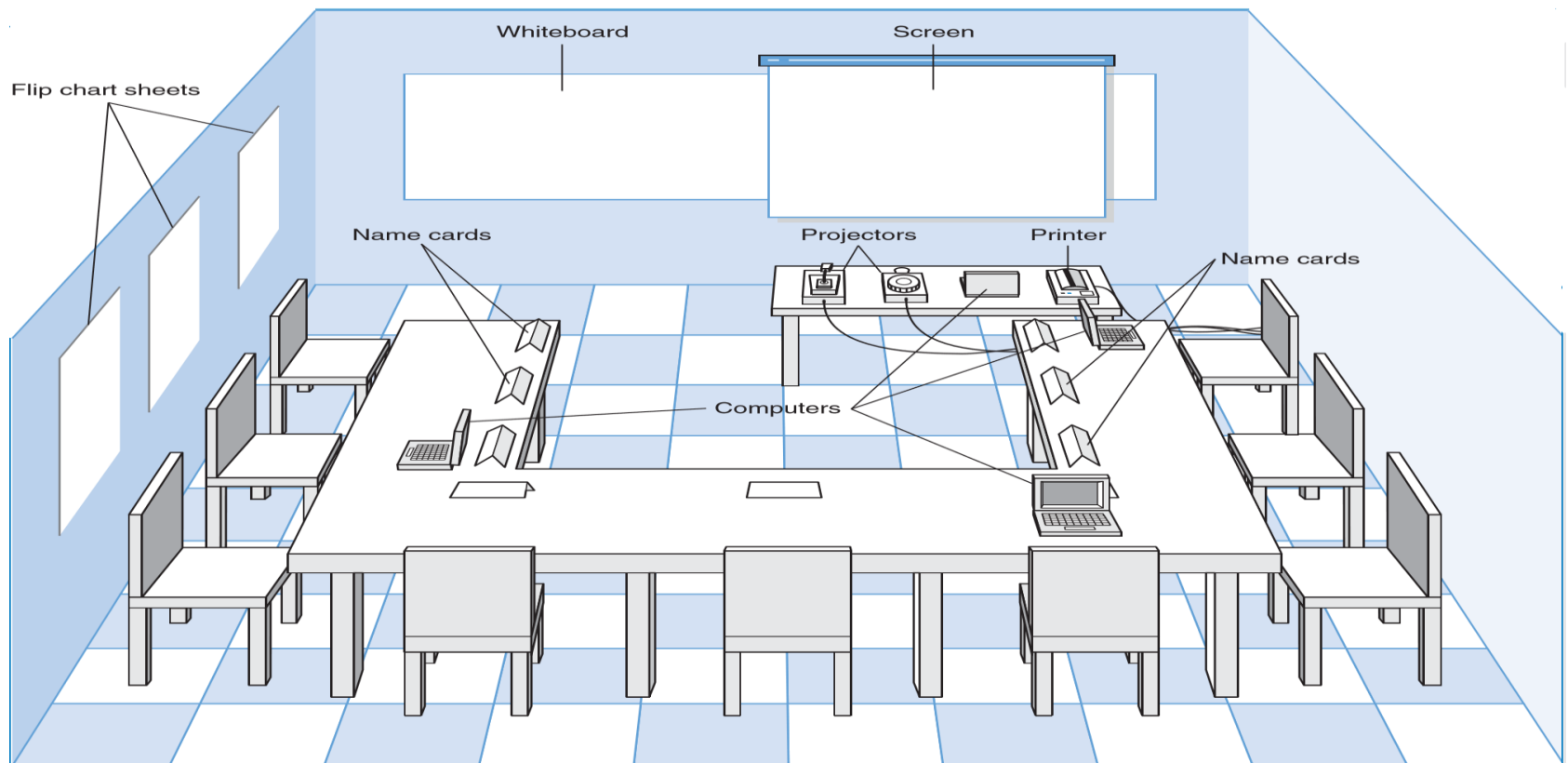
Comparison of Fact-Finding (Requirement Elicitation) Techniques

	Interview	JAD	Question-naires	Document Analysis	Observation
Type of information	As-is, improves, to-be	As-is, improves, to-be	As-is, improves	As-is	As-is
Depth of info	High	High	Medium	Low	Low
Breadth of info	Low	Medium	High	High	Low
Info integration	Low	High	Low	Low	Low
User involvement	Medium	High	Low	Low	Low
Cost	Medium	Low-medium	Low	Low	Low-medium

Preliminary Investigation Overview (Cont. 8)

- **Planning the Preliminary Investigation (Cont.)**
  - **Step 4 - Analyze project usability, cost, benefit, and schedule data**
    - Factors to consider
      - What information must be obtained, and how will it be gathered and analyzed?
      - Who will conduct the interviews? How many people will be interviewed?
      - Will a survey be conducted? Who will be involved? How much time will it take to tabulate the results?
      - How much will it cost to analyze the information and prepare a report with findings and recommendations?

Preliminary Investigation Overview (Cont. 9)

- **Planning the Preliminary Investigation (Cont.)**
  - **Step 5 - Evaluate feasibility**
    - Operational feasibility
    - Technical feasibility
    - Economic feasibility
    - Schedule feasibility

Preliminary Investigation Overview (Cont. 9)

- **Planning the Preliminary Investigation (Cont.)**
  - **Step 6 – Present results and recommendations to management**
    - Prepare a report that includes:
      - An evaluation of the systems request
      - An estimate of costs and benefits
      - A case for action

Preliminary Investigation Overview (Cont. 10)

- **Planning the Preliminary Investigation (Cont.)**
  - Format of a report
    - Introduction
    - Systems request summary
    - Findings
    - Recommendations
    - Project roles
    - Time and costs estimates
    - Expected benefits
    - Appendix

System Requirements Prioritization

- **Requirements must be SMART**
  - **S**pecific
  - **M**easurable
  - **A**ttainable
  - **R**ealistic
  - **T**ime-bound

- **Techniques—** Must, Should, Could, Won't or Would

System Requirements Prioritization

- **Factors that Affect Priority**
  - Will the proposed system reduce costs?
  - Will the system increase revenue for the company?
  - Will the systems project result in more information or produce better results?
  - Will the system serve customers better?
  - Will the system serve the organization better?
  - Can the project be implemented in a reasonable time period?
  - Are the necessary financial, human, and technical resources available?

System Requirements Prioritization (Cont.)

- **Discretionary and Nondiscretionary Projects**
  - **Discretionary projects:** Projects where management has a choice in implementing them
  - **Nondiscretionary projects:** Management has no choice in implementing a project
    - Most of these projects are predictable
      - Annual updates to payroll
      - Tax percentages
      - Quarterly changes

Lecture Summary

- Analysts evaluate the systems request and determine whether the project is feasible from an operational, technical, economic, and schedule standpoint

- Steps in the preliminary investigation
  - Understand the problem or opportunity
  - Define the project scope and constraints
  - **Perform fact-finding**
  - Analyze project usability, cost, benefit, and schedule data
  - Evaluate feasibility
  - Present results and recommendations to management

- Overall, we have discussed the strategies of identifying business and systems requirements.

Announcement (if any)

Q &A?

Thanks everyone !