Chapter 4
Skills for Troubleshooting Computer Problems

A GUIDE TO
COMPUTER USER SUPPORT
FOR HELP DESK AND SUPPORT SPECIALISTS
SIXTH EDITION BY FRED BEISSE

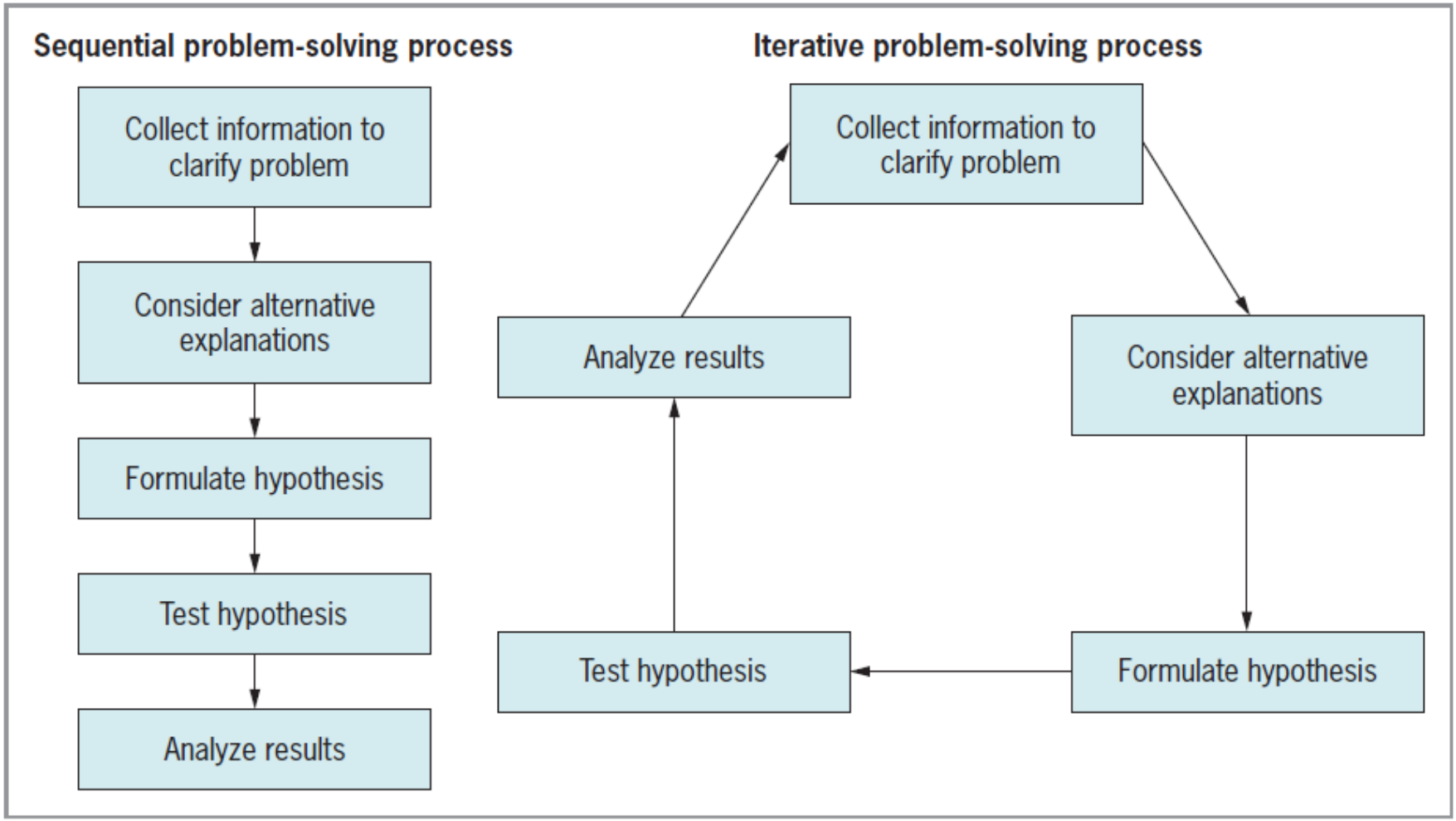
Chapter Objectives

- The troubleshooting process and the thinking skills required for successful troubleshooting
- Communication skills for troubleshooting
- Information resources to help solve computer problems
- Diagnostic and repair tools used to troubleshoot computer problems
- Strategies for troubleshooting
- How to develop your own approach to problem solving

What Is Troubleshooting?

- **Troubleshooting** is the process of defining, diagnosing, and solving technology problems
- It uses thinking and communications skills, information resources, strategies, and methods
- Is troubleshooting:
  - A step-by-step process?
  - An **iterative process**?
- Is troubleshooting:
  - A scientific process?
  - A creative process?

Sequential versus Iterative Problem-Solving Processes



Troubleshooting as an Iterative Process

- A repetitive process
- A creative process that requires flexible thinking
- Involves several paths or approaches to a problem
- Steps are repeated in a loop until a fruitful path is found
- Avoids a hit-or-miss, trial-and-error approach to troubleshooting

Thinking Skills Used in Troubleshooting

- Problem solving
- Critical thinking
- Decision making

Problem Solving

- **Problem solving** is a process that moves from the current state X (the problem state) to a **goal state** Y (the desired state)
  - Considers alternate paths to get from X to Y
- The objective in problem solving is to get from X to Y:
  - Quickly
  - Accurately
  - Effectively
  - Efficiently

A Problem-Solving Model

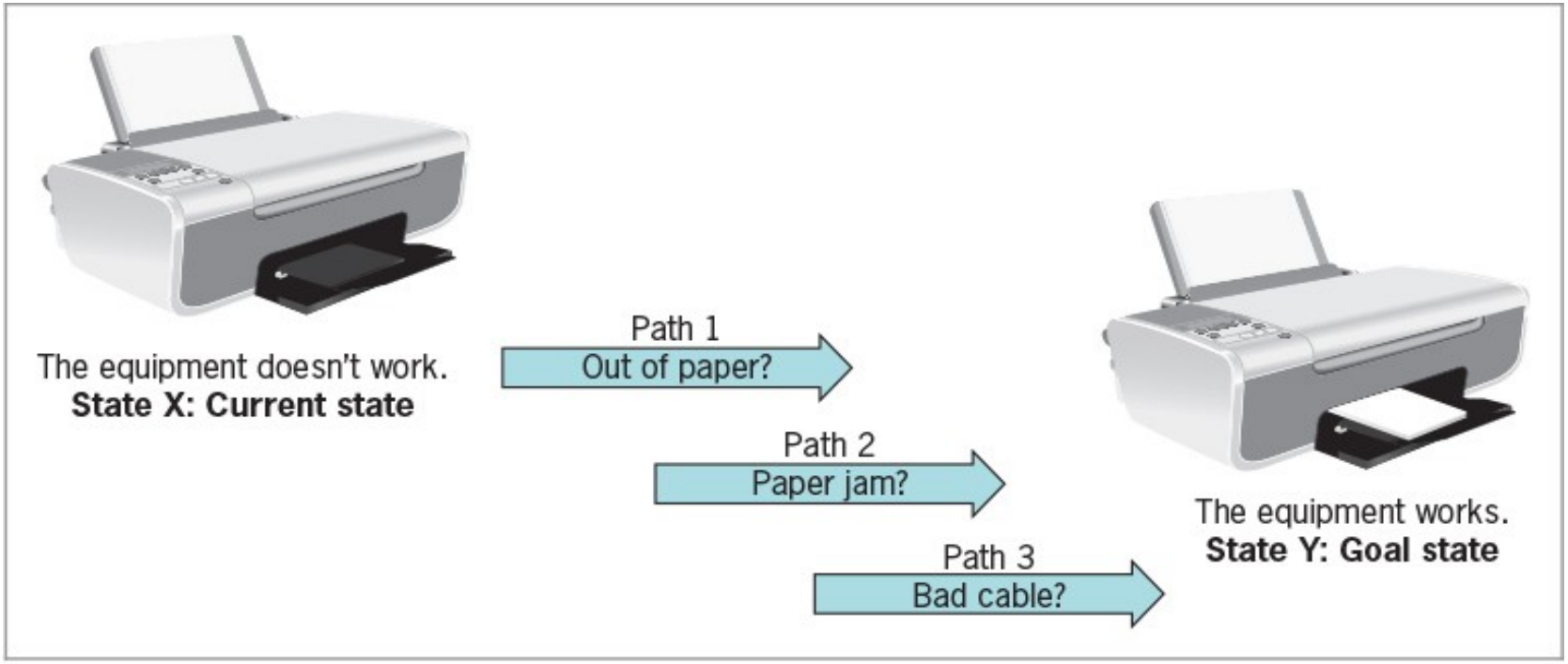


Figure 4-2 Problem-solving process

Problem Analysis

- Look for:
  - **Analogies**: How is this problem similar to others?
  - **Contradictions**: Two facts cannot be true at the same time
    - Use contradictions to challenge assumptions

Critical Thinking

- **Critical thinking** describes the cognitive skills used to:
  - Analyze a problem
  - Search for the underlying logic or explanation
  - Find alternate ways to think about or explain an event or problem situation
- Examples of critical thinking skills:
  - Mental models
  - Hypothesis testing
  - Creativity
  - Metacognition

Critical Thinking Skills

- **Mental model**: a conceptual picture to help understand how a system works
- **Hypothesis testing**: a guess or prediction about the cause of a problem, and a test to prove or disprove the **hypothesis**
- **Creativity**: the ability to find a novel or innovative solution to a problem
- **Metacognition**: the ability to step back from a problem and think about your own problem-solving thought processes

Metacognition

- Common metacognitive questions:
  - What assumptions did I make?
  - Where did I go wrong in my approach?
  - Why did one problem-solving approach work when another did not?
  - How could I have thought differently about this problem?

Decision Making

- **Decision making** is the ability to:
  - Weigh the pros and cons of each alternative against predefined criteria
  - Select an alternative from among competing alternatives
  - Reach a decision

Tools Troubleshooters Use

- Communication skills
- Information resources
- Diagnostic and repair tools
- Problem-solving strategies
- Personal characteristics

Communication Skills

- Most troubleshooting situations require at least some communication with an end user or vendor about a problem
- Types of communication skills:
  - Basic listening (or reading) skills
  - Active listening
  - Probes
  - Critical questions
  - Explanations
  - Verification

How Troubleshooters Use Communication Skills

- To get a basic description of a problem
- To learn the user's perspectives on the problem
- To probe for additional information
- To effectively communicate a solution back to the user

Basic Listening Skills

- Listen to (or read) the words a user chooses to describe the problem
- Allow a user enough time to explain a problem
- Try to obtain as accurate a description of the problem as possible
- Tip: Look for cause and effect, IF-THEN statements

Active Listening

- **Active listening** occurs when the listener is as engaged in the communication process as the speaker
  - Contrasted with a passive receiver of information
  - Active listening is two-way
  - Passive listening is one-way

Paraphrasing

- **Paraphrasing** is an active listening skill in which you restate in your own words what you heard a user say
- Used to resolve misunderstandings and get a clear problem description
- Example:
  - End-user description: *"I don't know what happened, but the program doesn't work."*
  - Support specialist paraphrase: *"Let me make sure I understand. The program used to work, but now it doesn't?"*

Probes

- **Probes** are follow-up questions designed to elicit additional information about a problem
- A sequence of probes often clarifies a problem situation
- Example:
  - *"When your computer crashes, is it always running the same program, or different ones?"*

Critical Questions

- **Critical questions** are designed to elicit important additional information from a user
  - Challenge assumptions a support specialist might make
  - Often reveal information a user wouldn’t have thought to relate
  - Questions to try when you’re stuck

Five Critical Questions

1. Has this system or component or feature *ever* worked?
2. Have you ever had this problem *before*?
3. Can this problem be *replicated*?
   - Is it repeatable?
4. What were you doing *just before* you first noticed the problem?
5. Have you made recent hardware or software *changes* to your device?

Explanations

- **Explanations** involve a support specialist describing the solution to a problem so a user understands:
  - Why the problem occurred
  - The steps required to resolve it

Verification

- **Verification** is a communication skill in which a support specialist makes sure that a user agrees that a problem has been resolved satisfactorily

Information Resources for Troubleshooting

- Personal experience
- Scripts and check lists
- Knowledge bases
- Coworkers and other professional contacts
- Support vendors and contractors
- Escalation and team problem solving

Troubleshooting Resource: Personal Experience

- Based on a support agent's education, career background, and previous experiences
- Search personal knowledge for information about a problem or for similar problems
- Tip: Develop a problem solution notebook
  - Make notes after a problem is solved
  - Organize notes by symptoms, equipment type, date, etc.

Troubleshooting Resource: Scripts and Checklists

- A script lists questions to ask and follow-up probes
- Organized as:
  - A flowchart
  - A decision tree
- Arranged in a logical sequence
- Covers the most common paths to solve a problem
- Example: see Figure 4-4 on page 161

Troubleshooting Resource: Knowledge Bases

- A **knowledge base** is an organized collection of information that is a resource in problem solving
  - Articles
  - Procedures
  - Tips
  - Pointers to information
  - Solutions to previous problems

Examples of Knowledge Bases

- Vendor manuals
- Trade books
- Trade periodicals and journals
- Online help
- Websites
- Search engines

Search Engine Guidelines

1. Use keywords that are nouns
2. Use present tense verbs
3. Include vendor name, model number, version number
4. Include operating system and version
5. Put quotes around phrases
6. Put + sign before essential keywords
7. Put – sign before keywords to eliminate
8. Refine searches with Boolean operators
   - *AND*, *OR*, *NOT*

Troubleshooting Resource: Coworkers and Other Professional Contacts

- Coworkers (“another set of eyes”)
- **Social media** (Facebook, Twitter, LinkedIn)
- Discussion forums (access to other users and professionals)
- **RSS feed** (Real Simple Syndication): a service that aggregates information from web resources and delivers it to subscribers in a convenient format
- **Newsgroups**: Internet discussion groups where participants with common interests in a topic post messages
- ListServs: sends automated email messages to subscribers based on interest in a topic

Troubleshooting Resource: Support Vendors and Contractors

- May have seen a baffling problem before and be able to offer suggestions to resolve it
- Outsourcing: an agreement with a support services vendor for problem-solving assistance, for a fee
  - Handle incidents that require special expertise
  - Provide backup to in-house support staff when the volume of incidents is heavy

Troubleshooting Resource:
Escalation and Team Problem Solving

- **Escalation** is the referral of a difficult or complex problem to a higher support level for resolution
- Team approach to problem solving
  - Mutual problem-solving assistance
  - The entire team owns the problem, not an individual

Diagnostic and Repair Tools

- Software utilities that help troubleshoot technology problems
- Categories:
  - General-purpose and remote diagnostic tools
  - Hardware problem diagnosis
  - Software problem diagnosis
  - Network problem diagnosis

General-Purpose and Remote Diagnostic Tools

- **Remote access** utilities help support users in distant locations
  - Support agents can:
    - View a remote user's screen
    - Enter commands on a user's system
    - Communicate with user via chat window
- Examples:
  - TeamViewer
  - LogMeIn
  - Rapid Assist
  - pcAnywhere
  - GoToMyPC

General-Purpose and Remote Diagnostic Tools

- **Virtual Private Network (VPN):** technology that uses the Internet to connect remote users to corporate servers
  - Employs strong user authentication and encryption
  - Provides better security than standard Internet protocols (http)
  - Often includes tools for remote access to user PCs

Hardware Problem Diagnosis Utilities

- Analyze and detect defective hardware components
- Identify performance problems
- Recover some lost data
- Document and optimize configuration information
- Examples:
  - PC Diagnostics
  - PC-Doctor
  - Seatools
  - Ultimate Boot Disk
  - CheckIt Diagnostics

Software Problem Diagnosis Utilities

- Identify configuration information
- Identify and repair configuration and performance problems
- Examples:
  - Advanced SystemCare
  - Windows Registry Cleaner
  - Windows Repair
  - Toolwiz Care
  - System Mechanic

Network Problem Diagnosis Utilities

- Identify network connectivity and configuration problems
- Monitor network operation and performance
- Identify some security breaches
- Help recover from network problems
- Examples:
  - OpManager
  - OpUtils
  - Network Performance Monitor
  - PRTG Network Diagnosis

Problem-Solving Strategies

- Look for a simple, obvious solution
- Attempt to replicate the problem
- Examine the configuration
- Initiate a root cause analysis
- View a system as a group of subsystems
- Use a module replacement strategy
- Apply a hypothesis-testing approach
- Restore a base configuration

Strategy: Look for a Simple, Obvious Solution

- Most computer problems are simple
  - Develop a check list of possible explanations or solutions
  - Check for disconnected cables
  - Reboot the system
  - Reinstall the software
- Tip: Don’t spend too much time looking for an explanation for N=1 problems (those that rarely reoccur)

Strategy:

Attempt to Replicate the Problem

- **Replication** is the process of trying to repeat a problem in the same or a different situation or environment
- Try moving a problem to a different computer or another user
- Examine results:
  1. The problem also appears in a different environment
  2. The problem is localized; only occurs in a specific environment

Strategy: Examine the Configuration

- Many problems occur because a combination of hardware and software does not work well together
- Check on hardware and software
  - Installation requirements
  - Possible incompatibilities
  - Mobile device settings options

Strategy:

Initiate a Root Cause Analysis

- **Root cause analysis** is a strategy that looks beyond the visible symptoms of a recurring problem to search for an underlying cause
  - An iterative process
  - Asks a series of *Why?* questions
- Steps:
  1. Identify (in writing) what the problem is
  2. Describe (in writing) why the problem occurs
  3. Return to step 1 until the root cause of a problem is identified

Strategy: View a System as a Group of Subsystems

- Sketch a block diagram of the subsystems and their relationship to each other
- Start:
  - At either end of a chain of subsystems
  - In the middle of the chain
- Trace the problem forward or backward

Strategy: Use a Module Replacement Strategy

- **Module replacement** involves replacing a suspected defective hardware or software component with one that is known to work
  - Swap out suspect hardware components
  - Reinstall software packages
- Tip: Don’t spend too many resources trying to repair an inexpensive, inoperative device – replace it.

Strategy: Apply a Hypothesis-Testing Approach

- Formulate a hypothesis—a guess or prediction—about the cause of the problem
  - Best guesses (hunches) are based on prior experience
  - Approach uses critical thinking skills
  - Tip: Try brainstorming with others to develop alternate hypotheses
- Design an experiment (a test) to see if a hypothesis is true or false
  - Look for contradictory evidence

Strategy: Restore a Base Configuration

- Eliminate **variables** or factors that can make a problem complex or complicated
  - Remove hardware components to simplify a configuration
  - Disconnect a system from a network to observe its standalone operation

Personal Characteristics of Successful Troubleshooters

- Exercise patience and persistence
- Enjoy the problem-solving process
- Enjoy working with people
- Look for learning opportunities
  - Tip: Subscribe to an online trade publication that offers a broad perspective on trends in the computer industry

Develop Your Own Approach to Problem Solving

- Identify the strengths you bring to each problem
- Identify areas for improvement in problem solving
- Identify which tools and skills have been successful in solving past problems
- Identify information resources that have proven useful in past situations
- Tip: A problem-solving approach is improved by the metacognition process (self-examination)

Chapter Summary

- Successful troubleshooting relies on an understanding of the troubleshooting process and uses thinking skills
- The troubleshooting process is:
  - Iterative
  - Creative
- Thinking skills for troubleshooting include:
  - Problem solving
  - Critical thinking
  - Decision making

Chapter Summary (continued)

- Troubleshooting uses several skills and tools
  - Communication skills
  - Information resources
  - Diagnostic and repair tools
  - Problem-solving strategies
  - Personal characteristics of troubleshooters

Chapter Summary (continued)

Problem-solving strategies:

1. Look for a simple, obvious solution
2. Attempt to replicate the problem
3. Examine the configuration
4. Initiate a root cause analysis
5. View a system as a group of subsystems
6. Use a module replacement strategy
7. Apply a hypothesis-testing approach
8. Restore a base configuration