



Chapter 6
Help Desk Operation

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

Chapter Objectives

- Help desk operational procedures
- The multilevel support model
- The incident management workflow
- Best practices in help desk operation
- The physical layout of help desk work areas
- Job stress in help desk work
- Hardware and software tools used by support agents, managers, and end users
- Help desk industry trends

What Is a Help Desk?

- An organization that provides a single point of contact for users in need of technical support
- Goal: Enhance client satisfaction by effectively and efficiently resolving problems and questions
 - Alternate titles: service desk, hotline, information center, user support, support consultant, client services

Multilevel Support Model

- **Multilevel support model:** a help desk structure
 - Organizes support staff and services into levels (tiers)
 - Each level is staffed by workers with different skills
 - Also called the frontline/backline model
- Goal: Handle as many incidents as possible at the lowest level (frontline) in the support hierarchy
 - Save scarce resources (backline) for incidents where more or different expertise is needed

Multi-level Support Model



Figure 6-1 Multilevel support model

The Incident Management Workflow

- **Incident management** is a well-defined, formal process help desk staff follow to:
 - Handle problem incidents
 - Get information to users
 - Solve user problems
 - Maintain records about the incident
- **Call management:** a subset of incident management primarily concerned with handling telephone contacts

Steps in the Incident Management Workflow

1. Receive the incident
2. Prescreen the incident
3. Authenticate the user
4. Log the incident
5. Screen the incident
6. Prioritize the incident
7. Assign the incident
8. Track the incident
9. Escalate the incident
10. Resolve the problem
11. Close the incident
12. Archive the incident

Steps in the Incident Management Workflow:

1. Receive the Incident

- Sources of incidents:
 - Email message
 - Web-based contact
 - In person
 - Web form
 - Phone call
 - Web chat
- Goals:
 - Establish an initial relationship with the user
 - Get basic information from the user
 - Who is the user?
 - What is the user's contact information?
 - What is the purpose of the contact?
 - May use a greeting script
 - Warn that the incident may be monitored
 - Apologize for response delay or wait time

Steps in the Incident Management Workflow:

2. Prescreen the Incident

- **Prescreening:** a filtering process to determine how the help desk staff will handle the incident
- Goal: Incident screener may handle a simple request for information
 - Product information
 - How to order
 - Where to purchase

Steps in the Incident Management Workflow:

3. Authenticate the User

- **Authentication procedure:** determines whether help desk staff are authorized to handle an incident
- May involve checking:
 - A product registration database
 - A product model or serial number
 - A warranty database
 - A support service database of authorized clients
- Goals:
 - Determine the status of each client
 - Filter out unauthorized clients
 - Establish a billing procedure (where appropriate)

Steps in the Incident Management Workflow:

4. Log the Incident

- **Logging:** begin to document the incident and the related problem
- Record basic information about the incident:
 - Trouble report form
 - Incident tracking database
- Goal: Start a record of the incident

Steps in the Incident Management Workflow:

5. Screen the Incident

- **Screening** categorizes and describes an incident
- Common incident categories:
 - Request for information
 - Question
 - Problem
 - Complaint
 - Work (or service) order
- Goals:
 - Define the category of an incident
 - Capture a brief description of the incident
- Tip: many help desks use additional subcategories

Steps in the Incident Management Workflow:

6. Prioritize the Incident

- **Priority code** is assigned based on:
 - How serious the problem is
 - How many users are affected
 - The consequences of not handling the problem immediately
- Goal: Priority code often determines the kind of attention an incident will receive from support staff
- Alternative to priority codes
 - Handle incidents on first-in, first-out (FIFO) basis

Priority Codes and Incident Handling

- Examples of priority codes:
 - 1 – Urgent
 - 2 – High priority
 - 3 – Medium priority
 - 4 – Low priority
- High-priority incidents are usually serious problems that affect the productivity of a large number of users
- Priority codes often affect the response time of support staff
- Priority codes may change as an incident is handled

Cisco's Priority Codes

- Priority codes at Cisco's Technical Assistance Center:
 - Priority 1: network down; no workaround available; business processes critical
 - Priority 2: network badly degraded; no workaround available; business processes impacted
 - Priority 3: network somewhat degraded; most business processes working
 - Priority 4: user needs installation or configuration support or information on a Cisco product

Priority Codes and Queue Management

- **Queue:** a waiting line into which incoming incidents are placed when they cannot be answered immediately by an incident screener
- Queues may be defined for:
 - Each priority code
 - Different products
 - Types of customers (free support versus fee-based)
 - Levels of support
 - Example: standard, enhanced, gold, platinum, premium

Steps in the Incident Management Workflow:

7. Assign an Agent

- When a level 1 incident screener cannot respond to an incident directly, it gets assigned to another agent who has:
 - Specific product knowledge
 - Specialized expertise
- Goal: Move each incident into a queue where it will get appropriate attention

Steps in the Incident Management Workflow:

8. Track the Incident

- **Tracking** updates incident information:
 - As an incident is processed
 - As new information is added to the incident log
- **Goals:**
 - Provides a record when important events occur
 - A history of how an incident was handled
 - Provides data
 - Measure the quality of incident handling
 - Evaluate support agent performance
 - Identify support staff training needs

Steps in the Incident Management Workflow:

9. Escalate the Incident

- Escalation is a normal process in which an incident is transferred to a higher level support agent who has:
 - Greater ability or expertise
 - Resources to handle more difficult problems
 - Escalation may be automatic if an incident is not resolved within a predefined time period
- Goal: Resolve a difficult problem effectively and efficiently
- Tip: Ownership of an incident should be clearly defined when an incident is escalated
 - Option 1: ownership stays with tier 1 agent
 - Option 2: ownership moves to higher tier (stays with incident)
 - Option 3: ownership transfers to team or manager

Steps in the Incident Management Workflow:

10. Resolve the Incident

- **Resolution:** the user's problem has been solved or information has been provided
 - A complaint may be referred to product designers/ developers as a suggestion for the next product revision cycle
- **Caveats:**
 - Not all incidents can be completely resolved by the incident management workflow
 - Resolution doesn't necessarily mean the client is completely satisfied
- **Goal:** Minimize the percentage of incidents that cannot be resolved satisfactorily

Steps in the Incident Management Workflow:

11. Close the Incident

- Incident **closing** may include:
 - Review the steps to solve the problem
 - Seek mutual agreement (verification) that a solution has been reached
 - Thank the user for contacting the help desk
 - Invite the user to contact the help desk again if not satisfied
 - Make final entries in the incident log or database
 - May provide a support satisfaction survey
- Goals:
 - Provide technical and interpersonal closure to an incident
 - Complete the log of the incident

Steps in the Incident Management Workflow:

12. Archive the Incident

- **Archive:** copy resolved incidents to a database of completed incidents
 - Incidents are retained in an active database as long as they remain relevant
- Goal: Reduce the size of the active database by removing less relevant information
- Incident archives:
 - Can be searched if needed in future problem-solving situations
 - Can serve as a source of data for statistical analysis of help desk performance

Best Practices for Help Desk Operations

- **Best practices:** procedures, tools, and methods that successful support groups use
- Example: **Information Technology Infrastructure Library (ITIL)** guidelines cover:
 - Incident management
 - Problem management
 - Change management
 - Release management
 - Configuration management

ITIL Best Practices

- Incident management: disruption of normal services
 - Goal: Restore technology services to normal quickly
- Problem management: strategies to find and fix the root cause of problems
 - Goal: Anticipate, repair, and eliminate the causes of problems
- Change management: plan for technology changes
 - Goal: Minimize the impact of changes on business operation
- Release management: implement change management procedures
 - Goal: Smooth implementation of changes
- Configuration management: maintain asset inventory database
 - Goal: Identify, control, monitor, and audit technology assets

Physical Layout of Help Desk Work Areas

- Desk in a cubicle
- Access to one or more computer systems
- Access to reference information library
- Telephone headset permits freedom of motion
- Issues
 - Job stress
 - Diversions for staff
 - Workplace ergonomics

Job Stress in Help Desk Work

- **Job stress** results from physical and emotional responses due to a mismatch between a worker's characteristics and job requirements
 - Inadequate training
 - Lack of qualifications or experience
 - Inadequate resources to perform tasks
 - Poor workplace ergonomics
 - Unrealistic management expectations
 - Abusive user or users with unrealistic expectations
 - Poor management practices
 - Impact of office politics
 - Work style differences among employees

Job Stress in Help Desk Work (continued)

- Symptoms of job stress
 - Fatigue and insomnia
 - Head and body aches
 - Inability to concentrate
 - Expressions of anger
 - Substance abuse
 - Low morale
 - Low self-esteem
- Solutions to job stress
 - Personal stress management techniques and strategies
 - Organizational change

Job Stress in Help Desk Work (continued)

- Changes in working conditions reduce job stress
 - Reduce
 - Excessive noise
 - Distractions
 - Interruptions
 - Work breaks
 - Frequent
 - Scheduled
 - Use of employee lounge, cafeteria, and break room

Help Desk Technology and Tools

- Impact of automation on help desk industry
 - Help desk software
 - Tools for agents
 - Tools for managers
 - Tools for end users
 - Computer telephony systems
 - Web-based support

Help Desk Software:

Help Desk Agent Tools

- Log and track incidents
 - Manage incident queues
 - Interface with telephone system
 - Set incident priorities
 - Assign incidents to support staff
 - Escalate incidents
- Client information
 - Store, edit, and recall client contact and location information in a database

Help Desk Software:

Help Desk Agent Tools (continued)

- Links to product information
 - Product features
 - Product limitations
 - New versions
 - Configuration constraints
 - Known bugs
 - Product availability

Help Desk Software:

Help Desk Agent Tools (continued)

- Access to configuration information for client systems
 - Hardware configuration
 - Software licenses
 - Network access protocols

Help Desk Software:

Help Desk Agent Tools (continued)

- Problem solution knowledge base
 - Contains information about common problems and their solutions
 - Sometimes called a “smart” database
 - May use search strategies based on artificial intelligence
 - Expert systems (sequences of IF-THEN rules)
 - Neural networks (automated learning systems)
 - Case-based reasoning (pattern-matching strategies)

Help Desk Software:

Help Desk Agent Tools (continued)

- Diagnostic utilities
 - Tools to assist in diagnosing and repairing problems
 - Remote access to user system
- Links to communication and information resources
 - External connections to email, chat, and web
 - Internal connections to:
 - Online help
 - Product documentation
 - Problem archives

Help Desk Software: Help Desk Agent Tools (continued)

- Product order entry
 - Order entry capability
 - Can integrate with other business systems, such as inventory, shipping, and invoicing

Help Desk Software:

Help Desk Agent Tools (continued)

- Agent **time management** tools
 - Calendaring
 - Automated reminders
 - Meeting and project scheduling
 - Warning alarms
 - Collaborative tools
 - To-do priority lists
 - Project management tools

Help Desk Software: Help Desk Management Tools

- Asset management
 - Equipment inventory
 - Asset ID numbers
 - Software licenses
 - System installation information
- Service management
 - Warranty information
 - Reminders of next preventive maintenance
 - Service history

Help Desk Software:

Help Desk Management

Tools (continued)

- **Service level agreement (SLA):** defines the level of service you expect from a vendor, laying out the metrics by which service is measured, as well as remedies or penalties should agreed-on service levels not be achieved. It is a critical component of any technology vendor contract.
 - Specifies response times
 - Specifies performance objectives
 - Monitors and reports contract performance
- SLAs can define three performance relationships:
 1. User support ☐ Internal users
 2. User support ☐ External clients
 3. User support ☐ Vendors

Help Desk Software: Help Desk Management Tools (continued)

- **Client feedback** includes evaluations collected from help desk users about their level of satisfaction with:
 - A product
 - Help desk services
 - Handling of a specific help desk incident

Help Desk Software: Help Desk Management Tools (continued)

- Statistical reports
 - Predefined Help Desk reports (examples)
 - Abandonment rate (callers who hang up)
 - Number and percent of unresolved incidents
 - Average length of time on hold (or waiting for response)
 - Average time to resolve problems
 - Productivity of agents based on performance indicators
 - Performance compared to SLA expectations
 - Inventory control reports
 - Frequency of problem types

Help Desk Software: Help Desk Management Tools (continued)

- Customizable interfaces, forms, and reports
 - Augment predefined reports to address specific management information needs
- Telephone system interface
 - Manages large numbers of incoming and outgoing calls
- Automated incident management
 - Defines IF-THEN business rules to automatically:
 - Route incidents to agents
 - Route incidents to queues
 - Escalate incidents

Help Desk Software:

Help Desk End User Tools

- Direct end user access to help desk software and databases reduces the cost to provide support
 - Access to information on support website
 - Product information
 - Problem incident archive
 - Ability to submit an incident via web or email
 - Monitor resolution progress
 - Submit incident feedback

Popular Help Desk Software Packages

- Large-scale enterprises
 - Help Desk Technology's ServicePRO
 - BMC's Service Desk
 - Epicor's IT Service Management
 - HEAT Service Management
 - TechExcel's ServiceWise
- Small or mid-scale
 - LBE Helpdesk
 - BMC's Track-It!
 - Soffront's Customer Helpdesk
 - ZenDesk

Popular Help Desk Software Packages (continued)

- Low-cost or free software for small help desk operations
 - Spiceworks
 - SysAid
 - SolarWinds Web Help Desk
- Many help desk software vendors offer evaluation versions that can be downloaded and used during a limited trial period without charge

LBE Helpdesk Job Ticket

The screenshot displays the LBE Desktop Helpdesk (Cengage) application. The window title is "LBE Desktop Helpdesk (Cengage)". The menu bar includes "File", "View", "Tools", "Window", and "Help". The toolbar contains various icons for file operations and help. The left sidebar shows a tree view with categories: "Helpdesk Jobs" (containing "Detailed" and "Summary"), "Linked Files", "Operator Activity", "Knowledgebase", "Customer Information" (containing "Customers", "Departments", "Contacts", "Assets"), "System Maintenance", and "Reports". The main content area is titled "Viewing Job Id: 4 for Barnett/Sydney/Mr/Design/Willamette Planni...". It includes tabs for "Action", "Notes on this action", "History", and "Linked files (0)". The "Problem" field contains "Can't print from his workstation.". The "To Do" field is empty. The "Status" is "Open", "Hrs.Mins spent on this action" is "00:10", and "Cost spent on this action" is "0.00". The "Solution" field is empty. Below these are several dropdown menus and text fields: "Contact" (Barnett/Sydney/Mr/Design/Willamette Planni...), "Category" (Software problem), "Asset" (Satellite PC/WS021/Workst...), "Priority" (Medium), "Pass to" (Rachel), "Actioned By" (Dispatch), "Target" (03-Apr-2014 17:00), "Actioned At" (02-Apr-2014 20:44), "Custom1", "Custom2", "Custom3", and "Custom4". There are also checkboxes for "Mail Contact", "Mail 'Pass To' Operator", and "Preview Message". At the bottom, there are buttons for "Save", "Save & Create Child", "Cancel", and "Help". The status bar at the bottom shows "Ver 4.0.194", "Ready", "4/2/2014", "8:55 PM", and "Rachel".

1

2

3

4

5

6a

6b

6c

6d

6e

6f

6g

Ver 4.0.194 Ready 4/2/2014 8:55 PM Rachel

Figure 6-3 Helpdesk job ticket for printing problem

LBE Helpdesk list of knowledgebase problems and solutions

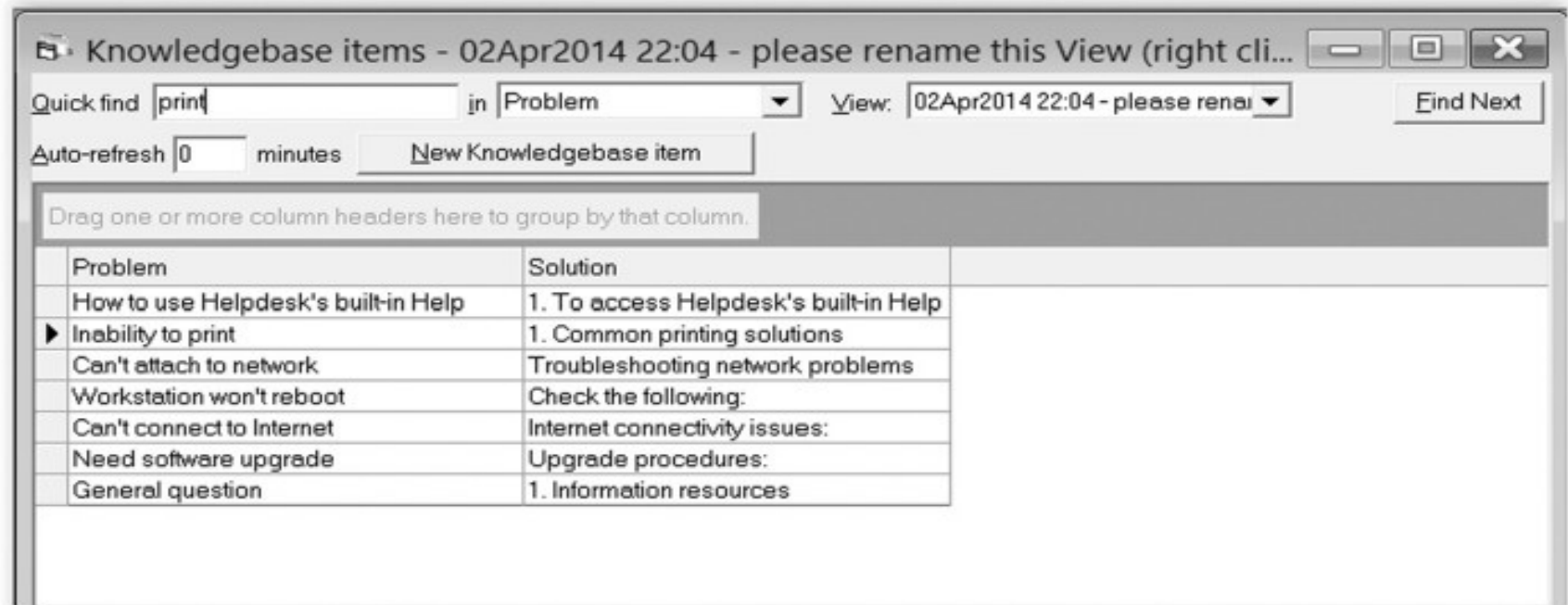


Figure 6-5 Helpdesk list of knowledgebase problems and solutions

LBE Helpdesk knowledgebase article

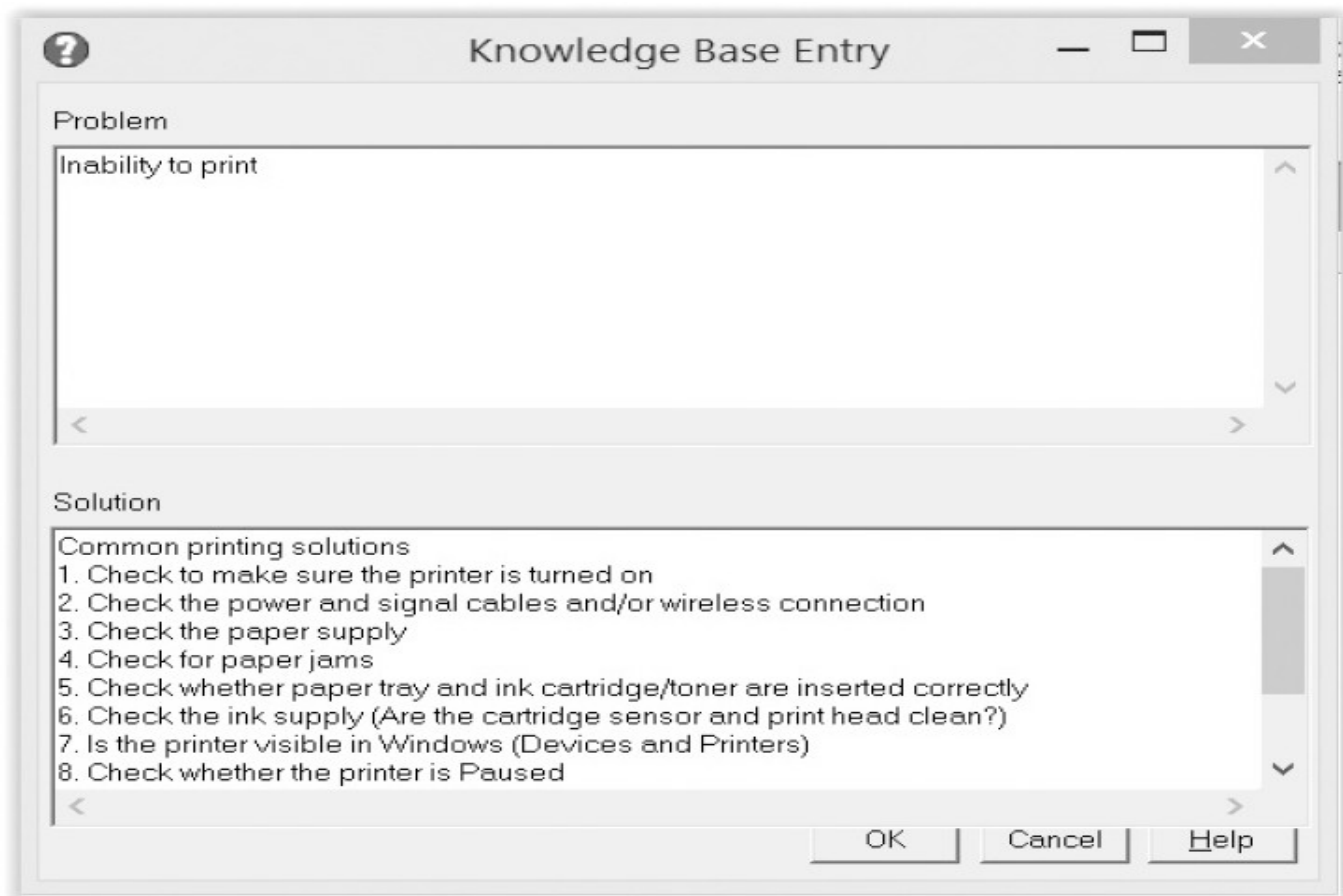
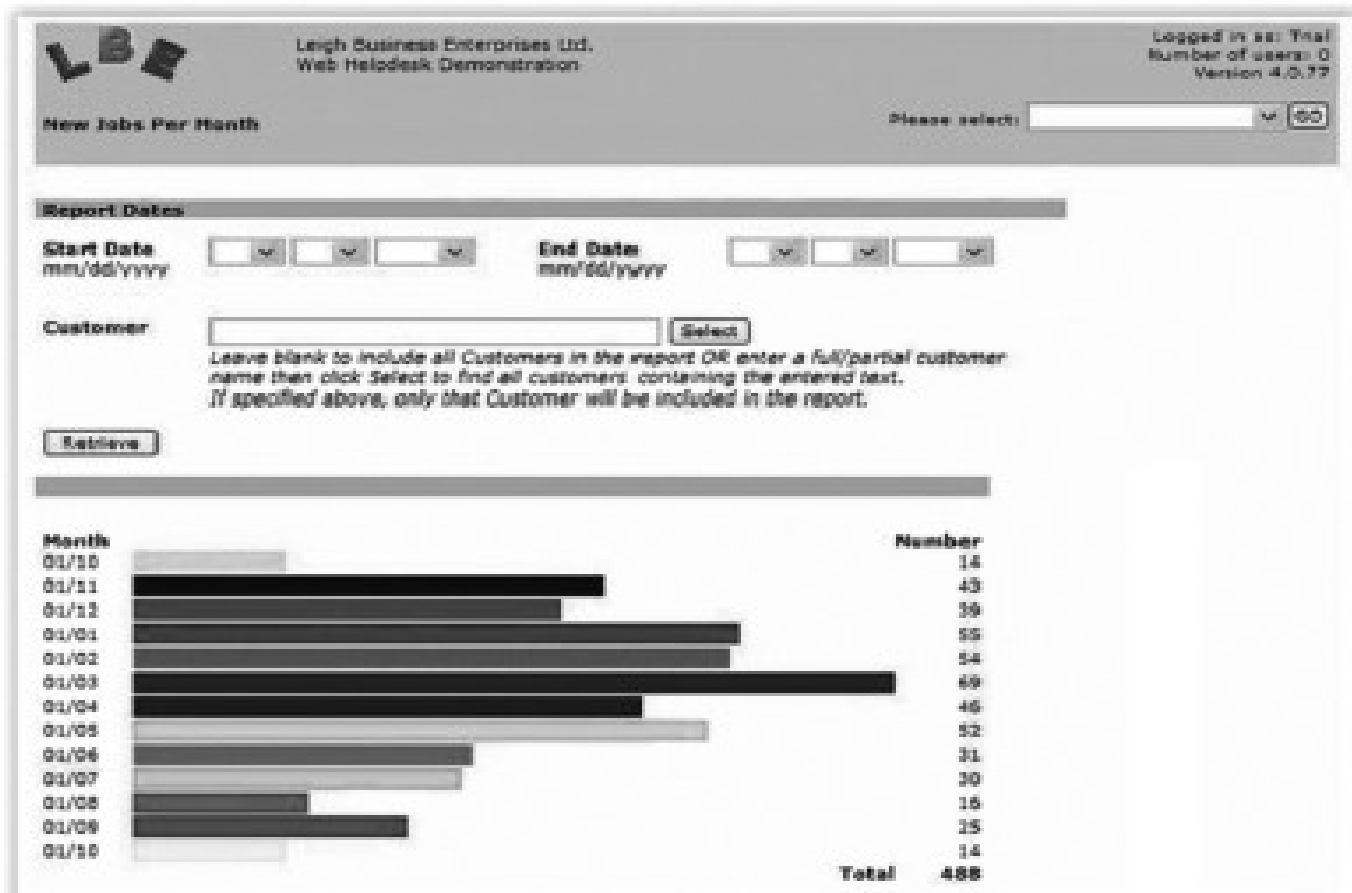


Figure 6-6 Helpdesk knowledge base article on solutions to printer problems

LBE Helpdesk predefined report



Computer Telephony Systems

- **Computer telephony:** the integration of computer and telephone technology into a seamless help desk communication tool
- **Automated call distributor (ACD):** a computer telephony system that automates the first steps in incident management
 - Answers calls
 - Greets callers
 - Provides menus
 - Manages call queues
 - Routes calls to available support agents

Computer Telephony Systems

(continued)

- ACD goals:
 - Reduce time and cost to respond to calls
 - Route calls to appropriate support agent
 - Collect information about performance of help desk operation
 - Monitor calls
- ACD problems:
 - Reputation for poor customer service
 - Poor design of menus
 - Lengthy hold times
 - Repetitious requests for information
 - Dropped calls

Computer Telephony Systems (continued)

- Common features of ACD systems
 - Skill set distribution: routes calls to agent with expertise
 - Overflow routing: reroutes calls to an available agent
 - Call accounting: provides statistics on calls received
 - Lost call reporting: provides statistics on abandonment rate
 - Queue time: provides statistics on time spent in queue
 - Agent performance: provides statistics on agent handling time
 - Call monitoring: records calls for worker training and evaluation

Computer Telephony Systems

(continued)

- **Interactive voice response (IVR):** lets the user interact with a database of information
 - User presses keys on the telephone handset
 - User speaks simple words into the telephone
- IVRs can be programmed with decision-tree logic to bypass a human agent to:
 - Ask questions
 - Provide responses

Web-Based Support

- Product information
- Order entry/fulfillment
- Rebate status
- Automated responses to information requests
- Online documents
- Software downloads
- Troubleshooting wizards
- Knowledge bases
- Forums and chat rooms
- Email access to staff
- Submit problem reports
- Contact information
- Customer satisfaction surveys
- Links to related sites

Web Support Advantages

- Lowers cost to provide support compared to other methods
- Helps users be more self-reliant
- Reduces errors due to misinformation and miscommunication
- Eliminates user time spent waiting on phone for help desk agent

Email Support Advantages

- Email is **asynchronous**
 - User and support worker do not have to be available online at exactly the same time
- Email responses make more flexible use of support agent's time
- Email responses to frequent questions can be composed in advance and pasted into messages

Impact of Web and Email Use

on Support Staff

- More efficient use of support staff resources
- Writing skills are more important for support workers than telephone skills
- Quick recall is less important than the ability to locate information
- The ability to listen is less important than the ability to read and understand
- Customer service skills remain important

Impact of Intranets on Support Staff

- **Intranet:** a network modeled after the Internet with information organized into webpages
 - Facilitates communication between an organization's employees and support staff
 - Uses familiar technology
 - Web browser
 - Search engine
 - Provides improved security for communication compared with the Internet

Trends in Help Desk Operation

- Technology trends
 - Cloud computing
 - Virtualization of computing platforms
 - Support for wireless technology
 - Remote diagnosis and voice response technologies

Trends in Help Desk Operation (continued)

- Help desk workplace trends
 - Increased outsourcing
 - Demand for certified workers
 - Telecommuting as a work style
 - Adoption of industry best practices (ITIL)
 - Use of web-based support portals
 - Pressure to reduce support costs
 - Reliance on quantitative metrics
 - Resources devoted to security
 - Help desk software integration

Technology Trends:

Cloud Computing

- **Cloud computing:** user access to computer applications, data, and services over the Internet
 - Subscription-based services
 - Pay-as-you-go model
- **Advantages**
 - Users always access the latest version of software
 - Programs and data are available from any Internet connection
 - Promotes collaboration among users
- **Disadvantages**
 - “When the Internet is down, you’re down.”
 - Security concerns
 - May not reduce costs

Technology Trends:

Cloud Computing (continued)

- Cloud computing relies on **server farms**
 - Large collections of interconnected computers
 - Large capacity networked storage devices
 - Accessed via the Internet
 - Located in large data centers
 - Provide built-in redundancy in case hardware devices fail

Technology Trends:

Virtualization of Computing Platforms

- **Virtualization:** a method of allocating computer resources into several separate execution environments
 - A virtual machine:
 - Operates in its own partition (memory, disk space)
 - Runs its own operating system and application software
 - Goals:
 - Reduce equipment costs
 - Increase support resources available to agents

Technology Trends: Support for Mobile & Wireless Technology

- Increased reliance on mobile and wireless devices
 - Cell phones
 - Smartphones
 - Tablet PCs
 - Bluetooth devices
 - MP3 players
 - PDAs
 - Netbook PCs
 - Book Readers
 - GPS units
 - Wi-Fi networks
 - Digital cameras
 - Wearable devices
- Mobile and wireless technologies will impact support services in several ways
 - As users bring their own mobile devices (BYOD) into the workplace, support organizations will be expected to support them and their connection to local networks
 - Advances in smartphone and tablet technologies will provide new ways for support workers to

Technology Trends: Remote Diagnosis and Voice Response

- Remote diagnosis
 - Shift in contact modes from face-to-face, on-site, and telephone support to a greater reliance on email, web chat, self-service and remote diagnosis of user technology problems
- Voice Response
 - Increased use of voice recognition and response in technology products will find their way into support service tools

Workplace Trends: Outsourcing

- Outsourcing
 - Onshore: companies contract with support service providers in the United States
 - Companies hire fewer support workers internally
 - Support service providers hire relatively more workers to support external clients
 - Employment trend: help desk agents find relatively more opportunities with outsourced service providers

Workplace Trends:

Outsourcing (continued)

- Outsourcing (continued)
 - Offshore: companies contract with support service providers in other countries
 - Primarily in Asia (especially India) and Europe
 - Raises several issues, including quality of support services and user communication with offshore providers
 - Relatively fewer user support jobs with external support providers in the United States
 - Relatively more support jobs in U.S. companies as internal support workers

Workplace Trends:

Support Worker Certification

- IT industry certification trends will impact support workers
 - Labor market certifications for help desk workers will change over time
 - From “useful-but-not-a-job-requirement”
 - To “this position-requires-industry-certification-of-job-skills”
 - There is currently no industry-wide agreement on the need for specific help desk certifications
 - Certification expectations differ according to company needs

Telecommuting as a Work Style

- **Telecommuting**: full- or part-time work performed at a home office for an employer
 - Reduces worker turnover
 - Decreases the need for office space
 - Decreases operating costs
 - Provides greater worker flexibility
 - Reduces employee's costs
 - Concerns about worker productivity, quality, supervision, and confidentiality of information
- Facilitated by **Voice over Internet Protocol (VoIP)**: transmits voice communications over the Internet rather than via telephone lines

Workplace Trends:

Industry Best Practices

- As the user support industry matures, increased recognition of the role of industry best practices
 - Example: the Information Technology Infrastructure Library (ITIL)
 - Help desk software packages often advertise they are “ITIL-compliant”

Web-Based Support Portals

- Support **portals**: Websites that provide a single point of access for all support services
 - A technical challenge is to provide accurate information
 - A customer service challenge is to provide high-quality user services
- Help desk worker skills trend
 - Less emphasis on telephone skills
 - Greater emphasis on comprehensive training for help desk workers

Workplace Trends: Pressure to Reduce Support Costs

- Challenge to support organizations and workers
 - Provide increased quality of help desk services to users and clients
 - Reduce the cost to provide services
 - Can you do both?
- Several industry trends respond to this challenge
 - Cloud computing
 - Outsourcing
 - Telecommuting
 - Web-base support portals
 - Interactive voice response technology
 - Remote diagnosis

Workplace Trends:

Reliance on Quantitative Metrics

- Measures of help desk staff and individual worker performance assist support managers with staffing and budgeting tasks
 - Statistical reports help measure
 - Volume of support incidents
 - Need for support workers
 - Categories of support incidents impact staffing needs
 - User satisfaction with support services
 - Provide justification for help desk staffing levels
 - Performance measures
 - Help managers evaluate workers
 - Provide input on training needs of support staff

Workplace Trends: Computer Security

- Security issues in technology are ongoing
 - Help desk staff need to keep up-to-date on security threats and tools available to protect users
 - Support workers can develop special expertise in computer security as a professional and career development opportunity

Workplace Trends: Help Desk Software Integration

- **Client relationship management (CRM):** meet the needs of each client by providing excellent customer service
 - Help desk services and user support are part of the larger business and government agency challenge to successfully manage the entire spectrum of client relationships

Chapter Summary

- The goal of help desk operations is to provide clients with a single point of contact for:
 - Information requests
 - Problem resolution
- Help desks are often organized as a multilevel or tier structure
 - Incident screener or dispatcher
 - Product specialist
 - Technical support specialist
 - Support supervisor or manager

Chapter Summary

- The steps in the incident management workflow are designed to effectively and efficiently manage the process of handling an incident
 1. Receive the incident
 2. Prescreen the incident
 3. Authenticate the user
 4. Log the incident
 5. Screen the incident
 6. Prioritize the incident
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Chapter Summary (continued)

- The Information Technology Infrastructure Library (ITIL) provides guidelines for support industry best practices
- A help desk's physical environment includes the workspace, furniture, computer equipment, and specialized telephone headsets
- Job stress may occur when the expectations of a position do not match an agent's personal characteristics

Chapter Summary (continued)

- Help desk software packages include tools for agents, managers, and end users designed to automate many incident management tasks
- Other automated tools include computer telephony systems such as automated call distributors (ACDs) and interactive voice response (IVR)
- Web-based and email support offer cost and efficiency advantages over face-to-face and phone support

Chapter Summary (continued)

- Technology trends
 - Cloud computing
 - Virtualization of software platforms
 - Wireless technology
 - Remote diagnosis and voice response technologies
- Help desk workplace trends
 - Outsourcing
 - Worker certification
 - Telecommuting
 - Industry best practices
 - Web-based support portals
 - Pressure to reduce support costs
 - Quantitative metrics
 - Computer security
 - Help desk software integration