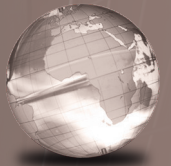


GLOBAL
EDITION



Systems Analysis and Design

TENTH EDITION

Kenneth E. Kendall • Julie E. Kendall





CONSULTING OPPORTUNITIES

1 SYSTEMS, ROLES, AND DEVELOPMENT METHODOLOGIES

- 1.1 Healthy Hiring: Ecommerce Help Wanted 41

2 UNDERSTANDING AND MODELING ORGANIZATIONAL SYSTEMS

- 2.1 The E in Vitamin E Stands for Ecommerce 59
- 2.2 Where There's Carbon, There's a Copy 78
- 2.3 Pyramid Power 79

3 PROJECT MANAGEMENT

- 3.1 The Sweetest Sound I've Ever Sipped 88
- 3.2 *Veni, Vidi, Vendi*, or, "I Came, I Saw, I Sold" 100
- 3.3 We're Off to See the Wizards 104
- 3.4 Food for Thought 109
- 3.5 Goal Tending 126

4 INFORMATION GATHERING: INTERACTIVE METHODS

- 4.1 Strengthening Your Question Types 146
- 4.2 Skimming the Surface 149
- 4.3 A Systems Analyst, I Presume? 155
- 4.4 The Unbearable Questionnaire 159
- 4.5 Order in the Courts 162

5 INFORMATION GATHERING: UNOBTRUSIVE METHODS

- 5.1 Trapping a Sample 174
- 5.2 A Rose by Any Other Name...Or Quality, Not Quantities 176

6 AGILE MODELING, PROTOTYPING, AND SCRUM

- 6.1 Is Prototyping King? 195
- 6.2 Clearing the Way for Customer Links 198
- 6.3 To Hatch a Fish 204
- 6.4 This Prototype Is All Wet 206

7 USING DATA FLOW DIAGRAMS

- 7.1 There's No Business Like Flow Business 249

8 ANALYZING SYSTEMS USING DATA DICTIONARIES

- 8.1 Want to Make It Big in the Theatre? Improve Your Diction(ary)! 267

9 PROCESS SPECIFICATIONS AND STRUCTURED DECISIONS

- 9.1 Kit Chen Kaboodle, Inc. 280
- 9.2 Kneading Structure 284
- 9.3 Saving a Cent on Citron Car Rental 289
- 9.4 A Tree for Free 293

Systems Analysis and Design, Global Edition

Table of Contents

Cover

Title Page

Copyright Page

Brief Contents

Contents

Part I: Systems Analysis Fundamentals

1. Systems, Roles, and Development Methodologies

Need for Systems Analysis and Design

Roles of a Systems Analyst

Systems Analyst as Consultant

Consulting Opportunity 1.1: Healthy Hiring: Ecommerce Help Wanted

Systems Analyst as Supporting Expert

Systems Analyst as Agent of Change

Qualities of a Systems Analyst

The Systems Development Life Cycle

Identifying Problems, Opportunities, and Objectives

Determining Human Information Requirements

Analyzing System Needs

Mac Appeal

Designing the Recommended System

Developing and Documenting Software

Testing and Maintaining the System

Implementing and Evaluating the System

The Impact of Maintenance

Using CASE Tools

The Agile Approach

Exploration

Planning

Iterations to the First Release

Productionizing

Maintenance

Object-Oriented Systems Analysis and Design

Object-Oriented Similarities to SDLC

Choosing Which Systems Development Method to Use

Table of Contents

Developing Open Source Software

Why Organizations Participate in Open Source Communities

The Role of the Analyst in Open Source Software

Hypercase Experience 1

Summary

Keywords and Phrases

Review Questions

Selected Bibliography

2. Understanding and Modeling Organizational Systems

Organizations as Systems

Interrelatedness and Interdependence of Systems

Consulting Opportunity 2.1: The E in Vitamin E Stands for Ecommerce

Virtual Organizations and Virtual Teams

Taking a Systems Perspective

Enterprise Systems: Viewing the Organization as a System

Depicting Systems Graphically

Systems and the Context-Level Data Flow Diagram

Systems and the Entity-Relationship Model

Use Case Modeling

Mac Appeal

Use Case Symbols

Use Case Relationships

Developing System Scope

Developing Use Case Diagrams

Developing Use Case Scenarios

Use Case Levels

Creating Use Case Descriptions

Why Use Case Diagrams Are Helpful

Levels of Management

Consulting Opportunity 2.2: Where There's Carbon, There's a Copy

Implications for Information Systems Development

Consulting Opportunity 2.3: Pyramid Power

Collaborative Design

Organizational Culture

Technology's Impact on Culture

Hypercase Experience 2

Summary

Keywords and Phrases

Review Questions

Table of Contents

Problems

Group Projects

Selected Bibliography

3. Project Management

Project Initiation

Problems in an Organization

Defining the Problem

Consulting Opportunity 3.1: The Sweetest Sound Ive Ever Sipped

Selection of Projects

Determining Feasibility

Determining Whether It Is Possible

Estimating Workloads

Ascertaining Hardware and Software Needs

Inventorying Computer Hardware

Evaluating Computer Hardware for Purchase

Renting Time and Space in the Cloud

Evaluation of Vendor Support for Computer Hardware

Understanding the Bring Your Own Device (BYOD) Option

Creating Custom Software

Consulting Opportunity 3.2: Veni, Vidi, Vendi, or, I Came, I Saw, I Sold

Purchasing COTS Software

Using the Services of a SaaS Provider

Evaluation of Vendor Support for Software and SAAS

Identifying, Forecasting, and Comparing Costs and Benefits

Forecasting

Identifying Benefits and Costs

Consulting Opportunity 3.3: Were Off to See the Wizards

Comparing Costs and Benefits

Managing Time and Activities

The Work Breakdown Structure

Time Estimation Techniques

Consulting Opportunity 3.4: Food for Thought

Project Scheduling

Using Gantt Charts for Project Scheduling

Using PERT Diagrams

Controlling a Project

Estimating Costs and Preparing the Budget

Mac Appeal

Managing Risk

Managing Time Using Expediting

Table of Contents

Controlling Costs Using Earned Value Management

Managing the Project Team

Assembling a Team

Communication Strategies for Managing Teams

Hypercase Experience 3.1

Setting Project Productivity Goals

Motivating Project Team Members

Managing Ecommerce Projects

Creating a Project Charter

The Systems Proposal

What to Include in a Systems Proposal

Consulting Opportunity 3.5: Goal Tending

Using Figures for Effective Communication

Hypercase Experience 3.2

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

Part II: Information Requirements Analysis

4. Information Gathering: Interactive Methods

Interviewing

Five Steps in Interview Preparation

Question Types

Arranging Questions in a Logical Sequence

Consulting Opportunity 4.1: Strengthening Your Question Types

Writing the Interview Report

Listening to Stories

Consulting Opportunity 4.2: Skimming the Surface

Stories Are Made Up of Elements

Reasons for Telling Stories

Joint Application Design

Conditions That Support the Use of JAD

Who Is Involved?

Where to Hold JAD Meetings

Hypercase Experience

Accomplishing a Structured Analysis of Project Activities

Potential Benefits of Using JAD in Place of Traditional Interviewing

Table of Contents

Potential Drawbacks of Using JAD

Using Questionnaires

Consulting Opportunity 4.3: A Systems Analyst, I Presume?

Planning for the Use of Questionnaires

Writing Questions

Consulting Opportunity 4.4: The Unbearable Questionnaire

Designing Questionnaires

Administering Questionnaires

Consulting Opportunity 4.5: Order in the Courts

Hypercase Experience 4.2

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

5. Information Gathering: Unobtrusive Methods

Sampling

The Need for Sampling

Sampling Design

The Sample Size Decision

Consulting Opportunity 5.1: Trapping a Sample

Analyzing Quantitative Documents

Systematically Examining Qualitative Documents

Consulting Opportunity 5.2: A Rose by Any Other Name . . . Or Quality, Not Quantities

Analyzing Qualitative Documents

Systematically Examining Qualitative Documents

Hypercase Experience 5.1

Using Text Analytics

Observing a Decision Makers Behavior

Observing a Typical Managers Decision-Making Activities

Observing the Physical Environment

Structured Observation of the Environment (STROBE)

Mac Appeal

Applying STROBE

Summary

Hypercase Experience

Keywords and Phrases

Table of Contents

Review Questions

Problems

Group Projects

Selected Bibliography

6. Agile Modeling, Prototyping, and Scrum

Prototyping

Kinds of Prototypes

Consulting Opportunity 6.1: Is Prototyping King?

The Users Role in Prototyping

Agile Modeling

Values and Principles of Agile Modeling

Consulting Opportunity 6.2: Clearing the Way for Customer Links

Activities, Resources, and Practices of Agile Modeling

The Agile Development Process

Consulting Opportunity 6.3: To Hatch a Fish

Scrum

Consulting Opportunity 6.4: This Prototype Is All Wet

Roles Played in Scrum

The Product Backlog

The Sprint Cycle

Other Unique Scrum Features

Kanban

Scrum Advantages and Disadvantages

DevOps: A Cultural Shift for App Development

Comparing Agile Modeling and Structured Methods

Lessons Learned from Agile Modeling

Improving Efficiency in Knowledge Work: SDLC versus Agile

Mac Appeal

Risks Inherent in Organizational Innovation

Hypercase Experience 6

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

Part III: The Analysis Process

7. Using Data Flow Diagrams

Table of Contents

The Data Flow Approach to Human Requirements Determination

Conventions Used in Data Flow Diagrams

Developing Data Flow Diagrams

Creating the Context Diagram

Drawing Diagram 0 (The Next Level)

Creating Child Diagrams (More Detailed Levels)

Checking Diagrams for Errors

Logical and Physical Data Flow Diagrams

Developing Logical Data Flow Diagrams

Developing Physical Data Flow Diagrams

Partitioning Data Flow Diagrams

A Data Flow Diagram Example

Developing the List of Business Activities

Creating a Context-Level Data Flow Diagram

Drawing Diagram 0

Creating a Child Diagram

Creating a Physical Data Flow Diagram from the Logical DFD

DFD

Partitioning Websites

Communicating Using Data Flow Diagrams

Consulting Opportunity 7.1: There's No Business Like Flow Business

Hypercase Experience 7

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

8. Analyzing Systems Using Data Dictionaries

The Data Dictionary

Need for Understanding the Data Dictionary

The Data Repository

Defining the Data Flows

Describing Data Structures

Logical and Physical Data Structures

Data Elements

Data Stores

Creating a Data Dictionary

Analyzing Input and Output

Developing Data Stores

Table of Contents

Consulting Opportunity 8.1: Want to Make It Big in the Theatre? Improve Your Diction(ary)!

Using a Data Dictionary

Using Data Dictionaries to Create XML

XML Document Type Definitions

XML Schemas

Hypercase Experience 8

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

9. Process Specifications and Structured Decisions

Consulting Opportunity 9.1: Kit Chen Kaboodle, Inc.

Overview of Process Specifications

Process Specification Format

Structured English

Writing Structured English

Consulting Opportunity 9.2: Kneading Structure

Data Dictionary and Process Specifications

Decision Tables

Developing Decision Tables

Consulting Opportunity 9.3: Saving a Cent on Citron Car Rental

Checking for Completeness and Accuracy

Decision Trees

Drawing Decision Trees

Consulting Opportunity 9.4: A Tree for Free

Choosing a Structured Decision Analysis Technique

Summary

Hypercase Experience 9

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

10. Object-Oriented Systems Analysis and Design Using UML

Object-Oriented Concepts

Objects

Table of Contents

Classes	
Inheritance	
Consulting Opportunity 10.1: Around the World in 80 Objects	
CRC Cards and Object Think	
Interacting During a CRC Session	
Unified Modeling Language (UML) Concepts and Diagrams	
Use Case Modeling	
Activity Diagrams	
Creating Activity Diagrams	
Consulting Opportunity 10.2: Recycling the Programming Environment	
Repository Entries for an Activity Diagram	
Sequence and Communication Diagrams	
Sequence Diagrams	
Communication Diagrams	
Class Diagrams	
Method Overloading	
Types of Classes	
Defining Messages and Methods	
Enhancing Sequence Diagrams	
A Class Example for the Web	
Presentation, Business, and Persistence Layers in Sequence Diagrams	
Enhancing Class Diagrams	
Relationships	
Generalization/Specialization (Gen/Spec) Diagrams	
Statechart Diagrams	
A State Transition Example	
Packages and Other UML Artifacts	
Consulting Opportunity 10.3: Developing a Fine System That Was Long Overdue: Using Object-Oriented Analysis for the Ruminski Public Library System	
Putting UML to Work	
The Importance of Using UML for Modeling	
Consulting Opportunity 10.4: C-Shore++	
Summary	
Hypercase Experience 10	
Keywords and Phrases	
Review Questions	
Problems	
Selected Bibliography	

Part IV: The Essentials of Design

Table of Contents

11. Designing Effective Output

Output Design Objectives

- Designing Output to Serve the Intended Purpose
- Designing Output to Fit the User
- Delivering the Appropriate Quantity of Output
- Making Sure the Output Is Where It Is Needed
- Providing Output on Time
- Choosing the Right Output Method

Relating Output Content to Output Method

- Output Technologies
- Factors to Consider When Choosing Output Technology

Consulting Opportunity 11.1: Your Cage or Mine?

Consulting Opportunity 11.2: A Right Way, a Wrong Way, and a Subway

Realizing How Output Bias Affects Users

- Recognizing Bias in the Way Output Is Used
- Avoiding Bias in the Design of Output

Designing Printed Output

Consulting Opportunity 11.3: Should This Chart Be Barred?

Designing Output for Displays

- Guidelines for Display Design
- Using Graphical Output in Screen Design
- Dashboards
- Infographics

Designing a Website

- Responsive Web Design
- Responsive Web Design
- Flat Web Design
- General Guidelines for Designing Websites

Consulting Opportunity 11.4: Is Your Work a Grind?

- Specific Guidelines for Website Design

Mac Appeal

Consulting Opportunity 11.5: A Field Day

Web 2.0 Technologies

Social Media Design

- Guidelines for Social Media Design

Designing Apps for Smartphones and Tablets

- Set Up a Developer Account
- Choose a Development Process
- Be an Original
- Determine How You Will Price the App

Table of Contents

- Follow the Rules
- Design Your Icon
- Choose an Appropriate Name for the App
- Design for a Variety of Devices
- Design the Output for the App
- Design the Output a Second Time for a Different Orientation
- Share a Prototype of Your Work
- Design the Apps Logic
- Design Movement
- Create the User Interface Using Gestures
- Protect Your Intellectual Property
- Market Your App

Output Production and XML

- Ajax

Hypercase Experience 11

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

12. Designing Effective Input

Good Form Design

- Making Forms Easy to Fill In
- Meeting the Intended Purpose
- Ensuring Accurate Completion
- Keeping Forms Attractive
- Controlling Business Forms

Good Display and Web Forms Design

- Keeping the Display Simple
- Keeping the Display Consistent
- Facilitating Movement
- Designing an Attractive and Pleasing Display
- Using Icons in Display Design

Consulting Opportunity 12.1: This Form May Be Hazardous to Your Health

Consulting Opportunity 12.2: Squeezin Isn't Pleasin

- Graphical User Interface Design
- Form Controls and Values
- Hidden Fields
- Event-Response Charts

Table of Contents

- Dynamic Web Pages
- Three-Dimensional Web Pages
- Ajax (Asynchronous JavaScript and XML)

Mac Appeal

- Using Color in Display Design

Website Design

Summary

Hypercase Experience 12

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

13. Designing Databases

Consulting Opportunity 13.1: Hitch Your Cleaning Cart to a Star

Databases

Data Concepts

- Reality, Data, and Metadata
- Files
- Relational Databases

Normalization

- The Three Steps of Normalization
- A Normalization Example
- Using an Entity-Relationship Diagram to Determine Record Keys
- One-to-Many Relationships
- Many-to-Many Relationships

Guidelines for Master File/Database Relation Design

- Integrity Constraints

Mac Appeal

- Anomalies

Making Use of a Database

- Steps in Retrieving and Presenting Data

Denormalization

Data Warehouses

Consulting Opportunity 13.2: Storing Minerals for Health, Data for Mining

- Online Analytical Processing
- Data Mining

Consulting Opportunity 13.3: Losing Prospects

Business Intelligence (BI)

Table of Contents

Data Analytics

Blockchains

Hypercase Experience 13

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

14. HumanComputer Interaction and UX Design

Understanding HumanComputer Interaction

How Fit Affects Performance and Well-Being

Usability

Designing for the Cognitive Styles of Individual Users

Physical Considerations in HCI Design

Considering Human Limitations, Disabilities, and Design

Implementing Good HCI Practices

Consulting Opportunity 14.1: School Spirit Comes in Many Sizes

Types of User Interface

Consulting Opportunity 14.2: Id Rather Do It Myself

Natural-Language Interfaces

Question-and-Answer Interfaces

Menus

Consulting Opportunity 14.3: Dont Slow Me Down

Form-Fill Interfaces

Choosing and Evaluating Interfaces

UX Design

Five Designer Actions that Promote Good UX Design

Five Designer Actions to Avoid in UX Design

UX Design Guidelines: An Ecommerce Example

Benefits of UX Design

Designing Interfaces for Smartphones and Tablets

Gestures

Alerts, Notices, and Queries

Badges

Design for Intelligent Personal Assistants

Designing for Virtual Reality and Augmented Reality

Guidelines for Dialogue Design

Meaningful Communication

Table of Contents

Minimal User Action

Consulting Opportunity 14.4: Waiting to Be Fed

Standard Operation and Consistency

Feedback for Users

Types of Feedback

Including Feedback in Design

Special Design Considerations for Ecommerce

Soliciting Feedback from Ecommerce Website Customers

Consulting Opportunity 14.5: When You Run a Marathon, It Helps to Know Where You're
Going

Mac Appeal

Easy Navigation for Ecommerce Websites

Mashups

Designing Queries

Query Types

Query Methods

Consulting Opportunity 14.6: Hey, Look Me Over (Reprise)

Hypercase Experience 14

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

Part V: Quality Assurance and Implementation

15. Designing Accurate Data Entry Procedures

Effective Coding

Keeping Track of Something

Classifying Information

Concealing Information

Revealing Information

Requesting Appropriate Action

General Guidelines for Coding

Consulting Opportunity 15.1: It's a Wilderness in Here

Consulting Opportunity 15.2: Catching a Summer Code

Effective and Efficient Data Capture

Deciding What to Capture.

Letting the Computer Do the Rest

Avoiding Bottlenecks and Extra Steps

Table of Contents

Starting with a Good Form

Choosing a Data Entry Method

Ensuring Data Quality through Input Validation

Consulting Opportunity 15.3: To Enter or Not to Enter: That Is the Question

Validating Input Transactions

Validating Input Data

The Process of Validation

Data Accuracy Advantages in Ecommerce Environments

Customers Keying Their Own Data

Storing Data for Later Use

Using Data through the Order Fulfillment Process

Hypercase Experience 15

Providing Feedback to Customers

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

16. Quality Assurance and Implementation

The Total Quality Management Approach

Six Sigma

Responsibility for Total Quality Management

Structured Walkthrough

Top-Down Systems Design and Development

Consulting Opportunity 16.1: The Quality of MIS Is Not Strained

Mac Appeal

Using Structure Charts to Design Modular Systems

Service-Oriented Architecture (SOA)

Documentation Approaches

Procedure Manuals

The FOLKLORE Method

Consulting Opportunity 16.2: Write Is Right

Hypercase Experience 16.1

Choosing a Design and Documentation Technique

Testing, Maintenance, and Auditing

The Testing Process

Consulting Opportunity 16.3: Cramming for Your Systems Test

Maintenance Practices

Table of Contents

Auditing

Implementing Distributed Systems

Client/Server Technology

Cloud Computing

Network Modeling

Training Users

Training Strategies

Guidelines for Training

Consulting Opportunity 16.4: You Can Lead a Fish to Water . . . but You Cant Make It Drink

Conversion to a New System

Conversion Strategies

Other Conversion Considerations

Organizational Metaphors and Their Relationship to Successful Systems

Security Concerns for Traditional and Web-Based Systems

Physical Security

Logical Security

Behavioral Security

Special Security Considerations for Ecommerce

Privacy Considerations for Ecommerce

Disaster Recovery Planning

Consulting Opportunity 16.5: The Sweet Smell of Success

Evaluation

Evaluation Techniques

The Information System Utility Approach

Consulting Opportunity 16.6: Mopping Up with the New System

Evaluating Corporate Websites

Hypercase Experience 16.2

Summary

Keywords and Phrases

Review Questions

Problems

Group Projects

Selected Bibliography

Glossary

Acronyms

Index