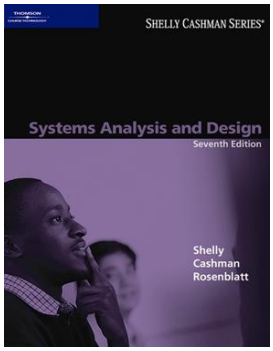
Systems Analysis & Design
7th Edition

Chapter 1



Chapter Summary by Antonay'a Judkins (animedragonfighter)

The headlines in the image below offer dramatic examples of how information technology affects our society.

Table of Contents

The Impact of Information Technology 1

The Future of IT 1

The role of System Analysis and Design 1

Who develop information systems? 1

Information System Components 1

Hardware 2

Software 2

Data 2

Processes 3

People 3

Understanding the Business 3

Business Profile 3

Business Models 3

New Kinds of Companies 4

Impact of the Internet 4

B2C (business-to-consumer) 4

B2B (Business-to-Business) 4

Web-based System Development 5

How businesses use Information Systems 5

Enterprise Computing Systems 5

Transaction Processing Systems 5

Business Support Systems 5

Knowledge Management Systems 6

User Productivity Systems 6

Information System Integration 6

Information System Users and Their Needs 7

Top Managers 7

Middle Managers and Knowledge 7

Supervisors and Team Leaders 7

Operational Employees 7
Systems Development Tools 8
Modeling 8
Prototyping 8
Computer-Aided Systems Engineering (CASE) Tools 8
Overview of System Development Methods 9
Structured Analysis 9
Systems Planning 9
Systems Analysis 9
Systems Design 9
Systems Implementation 10
System Support and Security 10
Object Oriented Analysis 10
Agile Methods 10
Other Development Methods 11
Systems Development Guidelines 11
Develop a Project Plan 11
Involve Users and Listen Carefully to Them 11
Use Project Management Tools to Identify Tasks and Milestones 11
Develop Accurate Cost and Benefit Information 11
Remain Flexible 11
Information Technology Department 12
Application Development 12
Systems Support and Security 12
User Support 12
Database Administration 12
Network Administration 12
Quality Assurance (QA) 12
The System Analyst Position 13
Responsibilities 13
Required Skills and Background 13
Certification 13

Career Opportunities 13
Job Titles *13*
Company Organization *13*
Company Size *13*
Corporate Culture *13*
Salary, Location, and Future Growth *14*

The Impact of Information Technology

Information Technology (IT) refers to the combination of hardware and software products and services that people use to manage, access, communicate, and share information.

The Future of IT

More than ever, business success depends on information technology. As IBM stated in its 2007 annual report "The Basic Computing Module has changed. The PC model of the 1980s has receded in importance to clients and has been replaced by a new paradigm, based on openness, networks, powerful new technology and the integration of digital intelligence into the fabric of work and life". Demand for IT jobs is expected to remain strong. Although economic trends affect IT spending levels, most business give IT budgets a relatively high priority, in good times or bad.

The role of System Analysis and Design

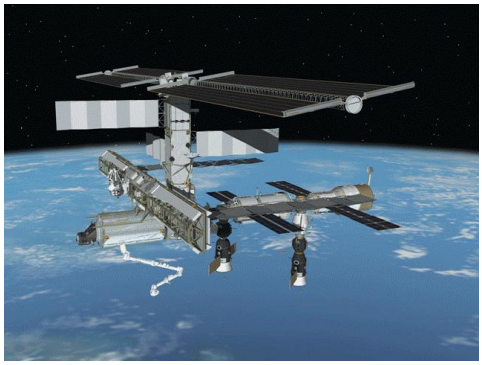
System analysis and design is a step-by-step process for developing high-quality information systems. An **information system** combines information technology, people, and data to support business requirements. With increasing demand for talented people, employment experts predict a shortage of qualified applicants to fill IT positions.

Who develop information systems?

Traditionally, a company either developed its own information systems, called **in-house applications**, or purchased systems called **software packages** from outside vendors. Regardless of development method, launching a new information system involves risks as well as benefits.

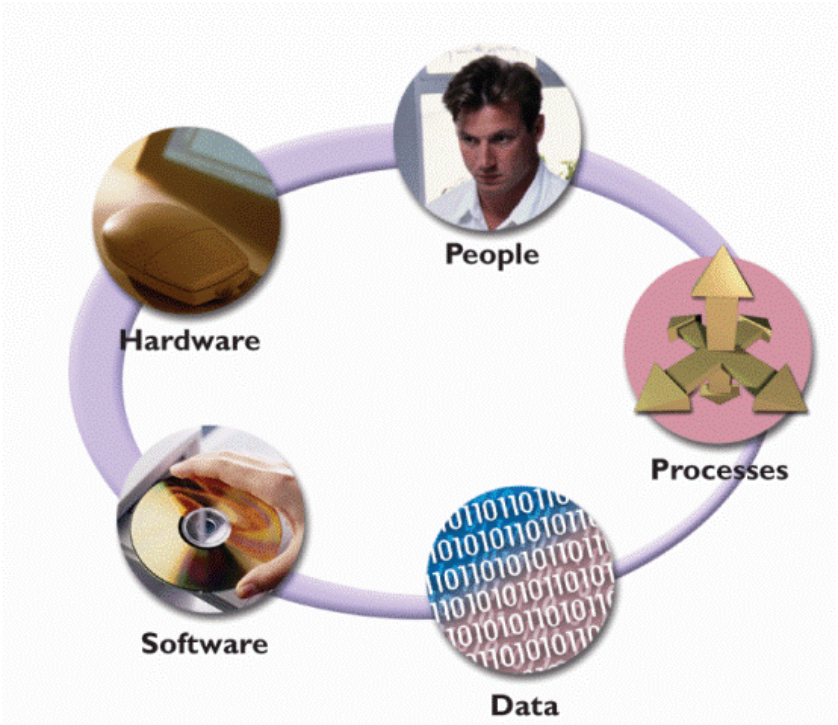
Information System Components

A **system** is a set of related components that produces specific results. A mission-critical system is one that is vital to a company's operations. Every system requires input data. In an information system, data consists of basic facts that are the system's raw material. Information is data that has been transformed into output that is valuable to users. An information system has five key components, as shown in the image on the next page: Hardware, software, data, processes, and people.



Hardware

Hardware consists of everything in the physical layer of the information system. Hardware purchasers today face a wide array of technology choices and decisions.

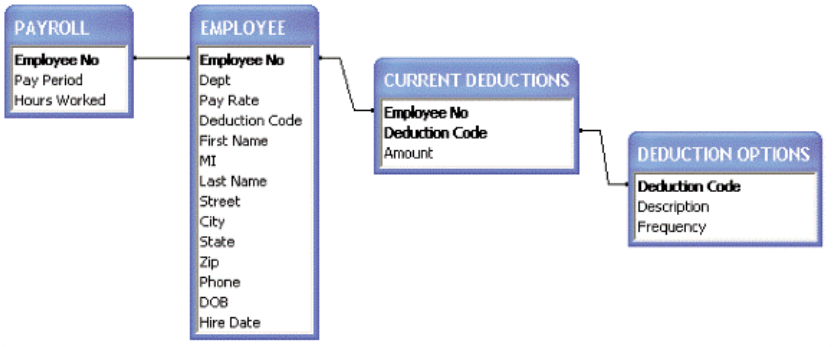


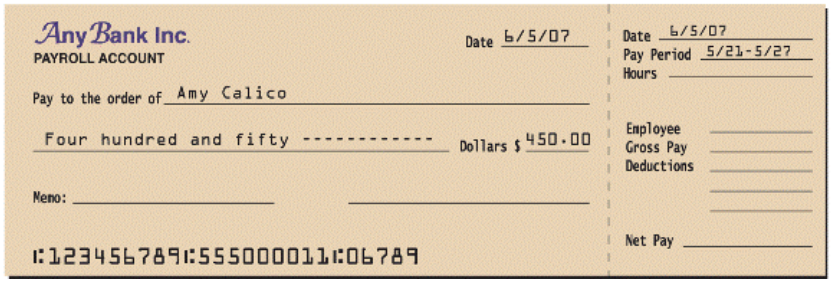
Software

Software refers to the programs that control the hardware and produce the desired information or results. System software manages the hardware components which can include a single workstation or a global network with many thousands of clients. **Application software** consist of programs that support day-to-day business functions that provide users with the information they require. Application software can serve one user or thousands of users throughout the organization. Examples of company-wide applications , called **enterprise applications**, include order processing systems, payroll systems, and company communication networks. Application software includes horizontal and vertical systems. A **horizontal system** is a system, such as an inventory or payroll application, that can be adapted for use in many different types of companies. A **vertical system** is designed to meet the unique requirements of a specific business or industry, such as a web-based retailer, a medical practice, or a video chain. Most companies use a combination of software that is acquired at various times.

Data

Data is the raw material that an information system transforms into useful information. The image to the right shows a payroll system that stores data in four separate tables.





Processes

Processes describe the tasks and business functions that users, managers and IT staff members perform to achieve specific results.

People

People who have an interest in an information system are called stakeholders. Stakeholders include the management group responsible for the system, the user (sometimes called end users) inside and outside the company who will interact with the system, and IT staff members, such as system analysts, programmers, and network administrators who develop and support the system. Each stakeholder group has a vital interest in the information system, but most experienced IT professionals agree that the success or failure of a system usually depends on whether it meets the needs of its users.

Understanding the Business

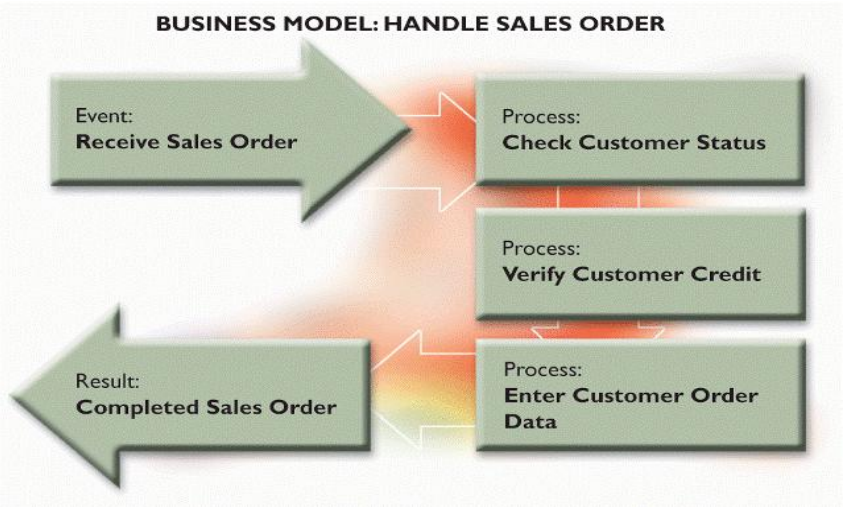
IT professionals must understand a company's business operations to design successful systems. System analyst use a process called **business process modeling** to represent a company's operations and information needs. As the business world changes, system analysts can expect to work in new kinds of companies that require innovative IT solutions.

Business Profile

A **business profile** is an overview that describes a company's overall functions, processes, organization, products, services, customers, suppliers, competitors, constraints, and future direction.

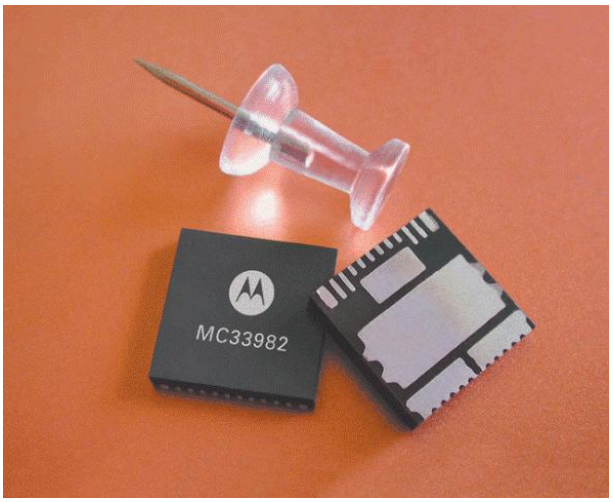
Business Models

Business models make it easier for managers and systems analysts to understand day-to-day business operations. A **business model** is a graphical representation of one or more business processes that a company performs, such as accepting an airline reservation, selling a ticket, or creating a customer account. A business process describes a specific set of transactions, events, tasks and results. For example, the image to the left shows a business model called HANDLE SALES ORDER. Notice that the model represents an event, three signature business processes, and a result. When companies attempt to simplify operations or reduce costs, a popular strategy is to have managers and system analysts perform **business process reengineering (BPR)**.



New Kinds of Companies

Traditionally, IT companies were identified as product-oriented or service-oriented. **Product-oriented** firms manufactured computers, routers, or the microchips shown in the image on the right, whereas **service-oriented** companies included resellers and providers of information and various IT services. Today, those distinctions are much less meaningful. The newest company category is **the Internet-dependent** firm, often described as a **dot-com (.com)** company because its primary business depends on the internet rather than a traditional business channel. At the other end of the spectrum are more traditional companies, sometimes called **brick-and-mortar** companies because they conduct business primarily from physical locations. In recent years, some internet-based companies have enjoyed spectacular growth, while others have fallen by the wayside. Rising fuel prices are also a factor in the success of Web-based firms.



Impact of the Internet

Internet-based commerce is called **e-commerce (electronic commerce)** or **I-commerce (internet commerce)**. E-commerce includes two main sectors: B2C (business-to-consumer) and **B2B (business-to-business)**.

B2C (business-to-consumer)

Using the internet, consumers can go online to purchase an enormous variety of products and services. B2C commerce is a changing traditional business models and creating new ones. In recent years, B2C accounted for a small portion of total retail sales, but B2C activity is expected to grow significantly.

B2B (Business-to-Business)

Although the business-to-consumer (B2C) sector is more familiar to retail customers, the volume of business-to-business (B2B) transactions is many times greater. Online trading marketing places initially was developed as company-to-company data-sharing arrangements called **electronic data interchange (EDI).** B2B volume soared, the development of **extensive markup language (XML)** enabled company-to-company traffic to the internet, which offered standard protocols, universal availability, and low communication costs. Because it allows companies to access the global market place, B2B is especially important to firms under pressure to reduce costs. On an industry-wide scale , many B2B sites exist where buyers, sellers, distributers, and manufacturers, can offer products, submit specifications and transact business. This popular form of online B2B interaction is called **supplier relationship management (SRM)**.

Web-based System Development

Internet-based systems development is changing rapidly, as software industry giants compete in market for overall software services, rather than individual products. For example, IBM claims that its **WebSphere** strategy is best while Microsoft counters worth a broad vision called **.Net** that redefines that company's approach to web-based application development. In addition, many firms offer **Web services**, which are internet-based support programs that can be executed as an integral part of an information system. Internet-based systems involve various hardware and software designs, but a simple model is a series of web pages that provides a user interface, which communicates with one or more levels of data management software and a Web-based database server.

How businesses use Information Systems

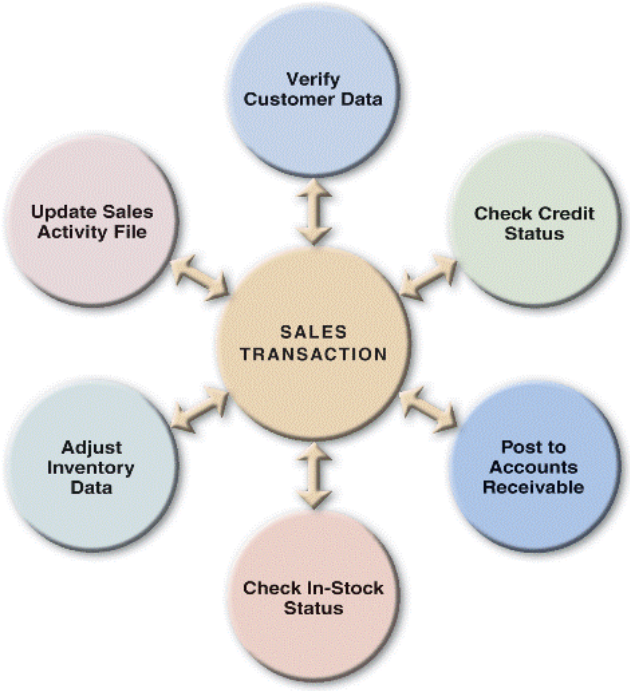
In the past, IT managers divided systems into categories based on the user group the system served. Today, traditional labels no longer apply.

Enterprise Computing Systems

Enterprise computing refers to information systems that support company-wide operations and data management requirements. In many large companies, applications called **enterprise resource planning (ERP)** systems provide cost-effective support for users and managers throughout the company. By providing a company-wide computing environment, many firms have been able to achieve dramatic cost reductions. Because of its growth and potential, many hardware and software vendors target the enterprise computing market and offer a wide array of products and services.

Transaction Processing Systems

Transaction processing (TP) systems process data generated by day-to-day business operations. TP systems perform a series of tasks whenever a specific transaction occurs. In the example shown in the image to the right, a TP system verifies customer data, checks the customer's credit status, posts the invoice the accounts receivable system, checks to ensure that the item is in stock, adjusts inventory data to reflect a sale, and updates the sales activity file. TP are efficient because they process a set of transaction-related commands as a group rather than individually.



Business Support Systems

Business support systems provide job-related information support to users at all levels

of a company. The earliest business computers systems replaced manual tasks, such as payroll processing. The new systems were called **management information systems (MIS)** because managers were the primary users. A business support system can work hand in hand with a TP system. To compete effectively, firms must collect production, sales, and shipping data to update the company-wide business support system immediately. The newest development in data acquisition is called radio frequency identification (RFID) technology which uses high-frequency radio waves to track physical object, such as the ones you see on clothes in the mall. An important feature of this business support system is decision support capability. For example, a truck fleet dispatcher might rune a series of **what-if** scenarios to determine the impact of increased shipments or bad weather.

Knowledge Management Systems

Knowledge management systems are called **expert systems** because they simulate human reasoning by combining a knowledge base and inference rules that determine how the knowledge is applied. A **knowledge base** consists of a large database that allows users to find information by entering keywords or questions in normal English phrases. A **knowledge management** system uses interface rules, which are rules that identify the data pattern and relationships. Knowledge management systems do not use strict logic rules. Instead, many knowledge management systems use a technique called **fuzzy logic**, that allows interferences to be drawn from imprecise relationships.

User Productivity Systems

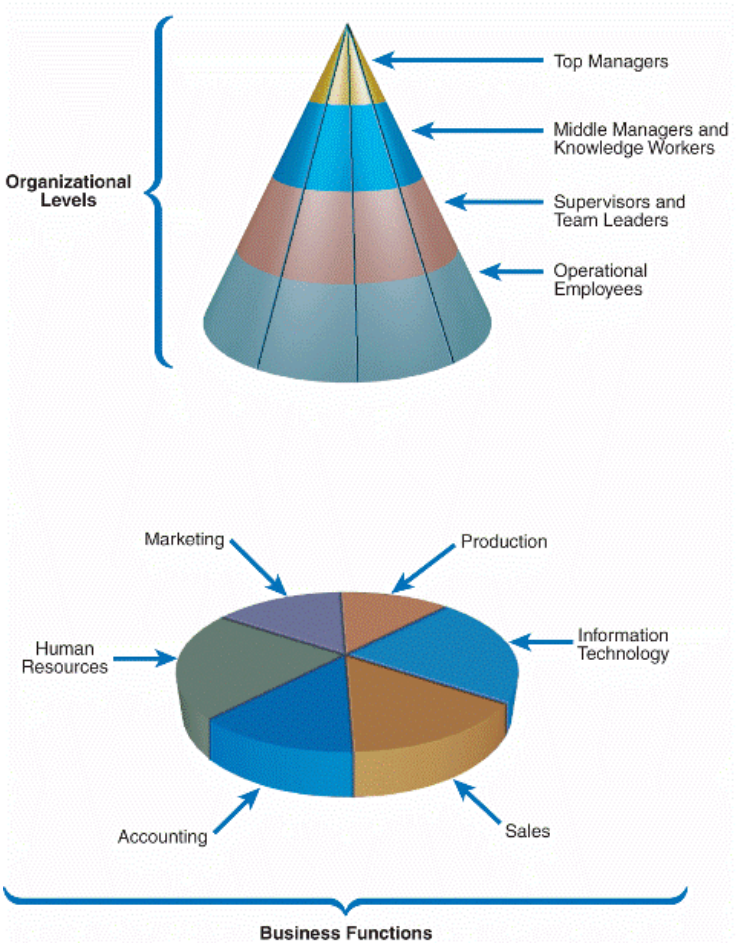
Companies provide employees of all levels with technology that improves productivity. Examples of **user productivity systems** include email, voice-mail, fax, video conferencing, word processing, automated calendars, database management, spreadsheets, desktop publishing, presentation graphics, company intranets, and high-speed internet access. **Groupware** programs run on a company intranet and enable users to share data, collaborate on projects, and work in teams. When companies first installed word processing systems, managers expected to reduce the number of employees as office efficiency increased. Computer-based office work expanded rapidly as companies assigned more responsibility to employees at lower organizational levels.

Information System Integration

Most large companies require systems that combine transaction processing, business support, knowledge management, and user productivity features.

Information System Users and Their Needs

Corporate organizational structure has changed considerably in recent years. A typical organizational model identifies business functions and organizational levels, as shown in the image on to the right. A system analyst must understand the company's organizational model to recognize who is responsible for specific processes and decisions and to be aware of what information is required by whom.



Top Managers

Top managers developing long-range plans, called **strategic plans**, which define the company's overall mission and goals. Strategic planning affects the company's future survival and growth, including long-term IT plans.

Middle Managers and Knowledge Workers

Just below the top management level, most companies have a layer of middle manager and knowledge workers. In addition to middle managers, every company has people called knowledge workers. **Knowledge workers** include professional staff members such as system analysts, programmers, accountants, researchers, trainers, and human resource specialists.

Supervisors and Team Leaders

Supervisors, often called team leaders, oversee operational employees and carry out day-to-day functions.

Operational Employees

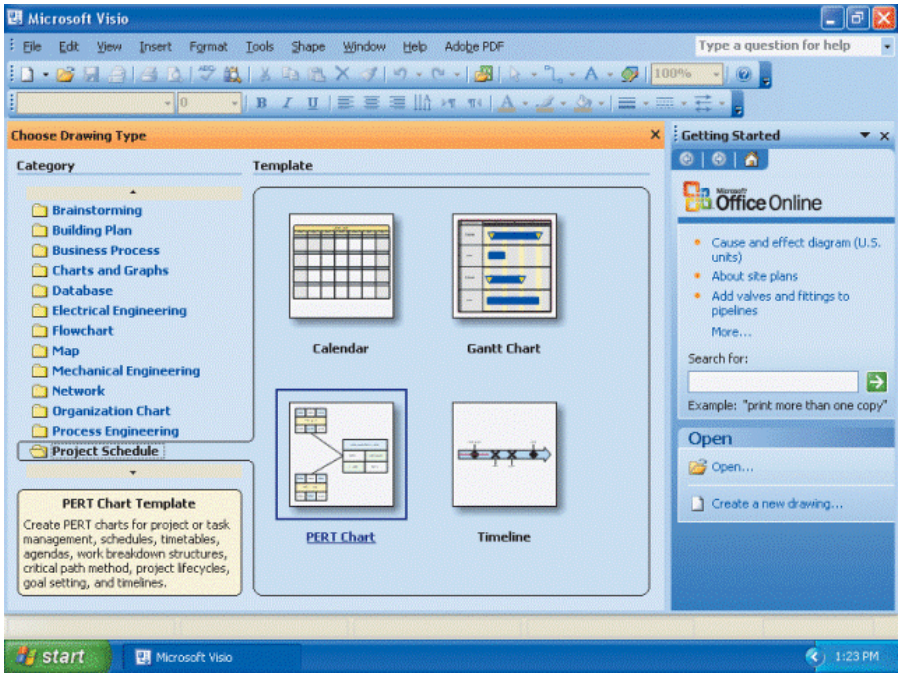
Operational employees include users who rely on TP systems to enter and receive data they need to perform their jobs. This trend, called **empowerment**, gives employees more responsibility and accountability.

Systems Development Tools

In addition to understanding business operations, systems analysts must know how to use a variety of techniques, such as modeling, prototyping, and computer-aided system engineering tools to plan, design, and implement information systems.

Modeling

Modeling produces a graphical representation of a concept or process that systems developers can analyze, test, and modify. A business model, or requirements model, describes the information that a system must provide. A data model describes data structures and design. An object model describes objects, which combine data and processes. A network model describes the design and protocols of telecommunications links. A process model describes the logic that programmers use to write code module. System developers often use multipurpose charting tools such as Microsoft Visio 2007 to display business-related models. Modeling involves various techniques, including data flow diagrams and entity-relationship diagrams (described in chapters 5 and 9), and unified modeling language diagrams (described in chapters and 6).



Prototyping

Prototyping tests system concepts and provides an opportunity to examine input, output, and user interfaces before final decisions are made. A **prototype** is an early working version of an information system. A possible disadvantage of prototyping is that important decisions might be made too early, before business or IT issues are understood thoroughly.

Computer-Aided Systems Engineering (CASE) Tools

Computer-aided systems engineering (CASE), also called **computer-aided software engineering**, is a technique that uses powerful software called **CASE tools**, to help systems analysts develop and maintain information systems. Because CASE tools make it easier to build an information system, they boost IT productivity and improve the quality of the finished product.

Overview of System Development Methods

Many options exist for developing information systems, but the most popular alternatives are **structured analysis**, which is a traditional method that still is widely used, **object oriented analysis (O-O)**, which is a more recent approach that many analysts prefer, and **agile methods**, which include the latest trends in software development. Although most projects utilize one of these approaches, it is not unusual for system developers to mix and match methods to gain better perspective. Regardless of the development strategy, people, tasks, timetables, and costs must be managed effectively. **Project management** is the process of planning, scheduling, monitoring, controlling, and reporting upon the development of an information system.

Structured Analysis

Structured analysis is a traditional systems development technique that is time-tested and easy to understand. Structured analysis uses a series of phases, called the **systems development life cycle (SDLC)**, to plan, analyze, design, implement, and support an information system. Structured analysis is based on an overall plan, similar to a blueprint for constructing a building, so it is called a **predictive** approach. Structured analysis uses a set of process models to describe a system graphically. Because it focuses on process that transforms data into useful information, structured analysis is called a **process-centered** technique. Process modeling identifies the data flowing into a process, the business rules that transform the data, and the resulting output data flow. Structured analysis uses the SDLC to plan and manage the systems development process. In the **waterfall model**, the result of each phase is called a deliverable, or **end product**, which flows into the next phase. The SDLC model usually includes five steps which are described in the following sections: systems planning, systems analysis, systems design, systems implementation, and system support and security.

Systems Planning

The **systems planning phase** usually begins with a formal request to the IT department, called a **systems request**, which describes problems or desired changes in an information system or a business process. The purpose of this phase is to perform a **preliminary investigation** to evaluate an IT-related business opportunity or problem. A key part of the preliminary investigation is a **feasibility study** that review anticipated costs and benefits and recommends a course of actions based on operational, technical, economic, and time factors.

Systems Analysis

The purpose of **the systems analysis phase** is to build a logical model of the system. The first step is **requirements modeling**, where business processes and document what the new system must do to satisfy users. The deliverable for systems analysis phase is the **system requirements documentation**.

Systems Design

The purpose of the **systems design phase** is to create a physical model that will satisfy all documented requirements for the system. The deliverable for this phase is the **system design specification**, which is presented to management and users for review and approval.

Systems Implementation

During the **systems implementation phase**, the new system is constructed. The systems implementation phase also includes an assessment, called a **systems evaluation**, to determine whether the system operations properly and if costs and benefits are within expectations.

System Support and Security

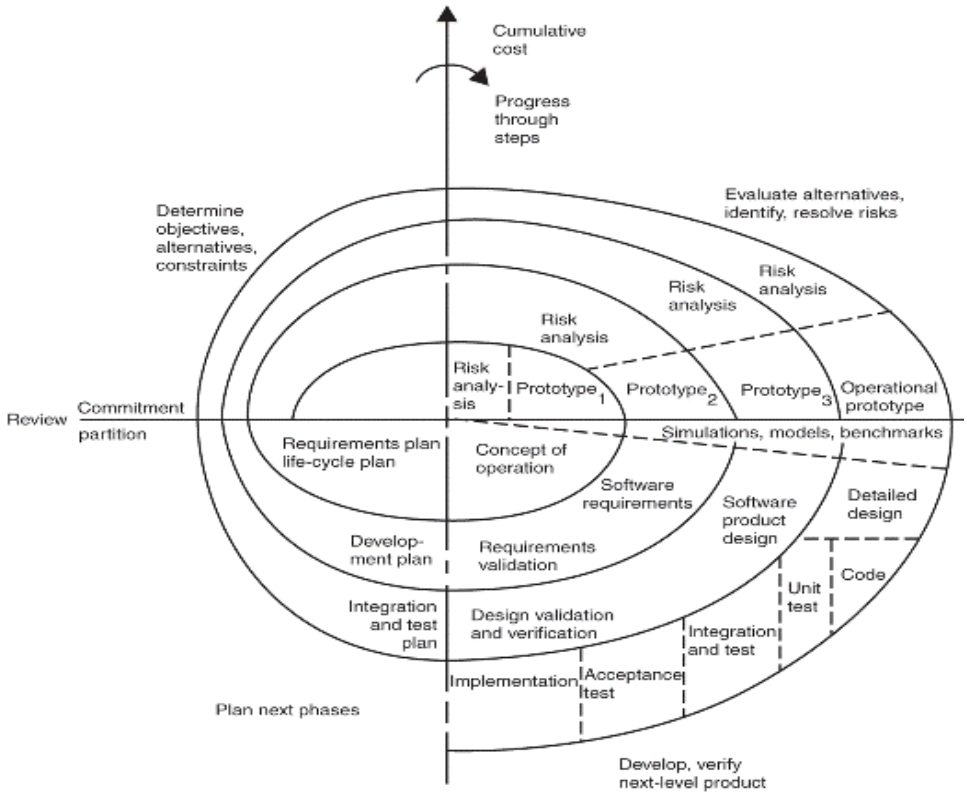
During the **systems support and security phase**, he IT staff maintains enhances and protects the system. A **scalable design** can expand to meet new business requirements and volumes.

Object Oriented Analysis

Whereas structured analysis treats processes and data as separate components, object-oriented analysis combines data and the processes that act on the data into things called **objects**. An object is a member of a **class**, which is a collection of similar objects. Objects possess characteristics called **properties**, which the object inherits from its class or possesses on its own. In O-O design, built-in processes called **methods** can change an objects properties. One object can send information to another object by using a message. A **message** request specific behavior or information from another object. Object related methods usually follow a series of analysis and design phases that are similar to SDLC, although there is less agreement on the number of phases their names. An **interactive model** can accurately depict a real-world business process. O-O methodology is popular because an easy transition to O-O programming languages such as Java, Smalltalk, C++, and Perl.

Agile Methods

Development techniques can change over time. Although relatively new software development, the notions of **iterative** development can be traced back about 20 years to Japanese auto firms that were able to boost productivity by using a more flexible manufacturing system, where team-based effort and short-term milestones helped keep quality up and costs down. Because it stresses a team-based culture, the agile community has published the **agile manifesto**, which is a set of principles. Agile methods typically use a **spiral model**, which represents a series of iterations, or revisions based on the user feedback as shown in the image to the right. Spiral models initially



were suggested in the 1990s by Barry Boehm, a noted software engineering professor. Numerous other adaptive variations and related methods exist, and most IT developers expect this trend to continue in the future. **Scrum**, which actually is a rugby term, is a popular process with agile developers, and refers to a powerful effort to achieve short-term goals. **Extreme Programming (XP)** is another adaptive process that focuses on the forceful interaction between developers and users to define and achieve project goals. Although agile methods are becoming popular, analysts should recognize that these approaches have advantages and disadvantages. Other potential disadvantages of agile methods can include weak documentation, blurred lines of accountability, and too little emphasis on the business picture.

Other Development Methods

Although agile methods are relatively new, IT departments have long sought to avoid systems that were developed without sufficient input from users. Two methodologies became popular: **joint application development (JAD)** and **rapid application development (RAD)**. Both JAD and RAD use teams composed of users, managers and IT staff. In addition to the methods described in this chapter, you might encounter other systems development techniques. For example, a popular approach offered by the rational group at IBM is called the **Rational Unified Processes (RUP®)**. Another option is what Microsoft calls **Microsoft Solutions Framework (MSF)**, which documents the experiences of its own software development teams. Companies often choose to follow their own methodology.

Systems Development Guidelines

With experience as a systems analyst, you will develop your own style and techniques.

Develop a Project Plan

Prepare an overall project plan and stick to it.

Involve Users and Listen Carefully to Them

Ensure that users are involved in the development process, especially when identifying and modeling system requirements.

Use Project Management Tools to Identify Tasks and Milestones

Regardless of the development methodology, the systems analyst must keep the project on track and avoid surprises. In chapter 3, you will learn how to use Microsoft Project 2007 to help you define tasks, manage resources, monitor progress, and create reports on systems development projects.

Develop Accurate Cost and Benefit Information

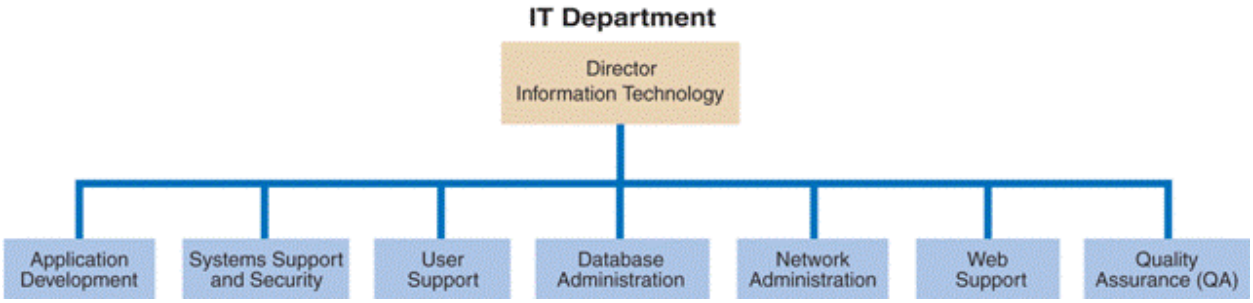
Provide accurate and reliable cost and benefit information.

Remain Flexible

Be flexible within the framework of your plans.

Information Technology Department

The information technology (IT) department develops and maintains a company's information systems. The IT group provides **technical support**, which includes six main functions: application development, systems support and security, user support, database administration, network administration, and network support.



Application Development

Traditionally, IT departments had an **application development** group composed of systems analysts and programmers who handled information system design, development, and implementation.

Systems Support and Security

Systems support and security provides vital protection and maintenance services for system hardware and software, including enterprise computing systems, networks, and transaction processing systems, and corporate IT infrastructure. If a site has a large number of remote clients, the systems support group often includes a **deployment team** that installs and configures workstations.

User Support

User support provides users with technical information, training, and productivity support. The user support function usually called a **help desk** or **information center (IC)**. In many companies, the user support team also installs and configures software applications that are used within the organization.

Database Administration

Database administration involves database design, management, security, backup, and user access.

Network Administration

Business operations depend on telecommunication networks that enable company-wide information systems. Network administration includes hardware and software maintenance, support, and security.

Quality Assurance (QA)

Many large IT departments also use a **quality assurance (QA)** team that reviews and tests all applications and systems changes to verify specifications and software quality standards.

The System Analyst Position

A systems analyst investigates, analyzes designs, installs, evaluates, and maintains a company's information system. Most companies assign System Analyst to the IT department, but analysts also can report to a specific user area such as marketing, sales, or accounting.

Responsibilities

The systems analyst's job overlaps business and technical issues. A systems analyst plans projects, develops schedules, and estimates costs.

Required Skills and Background

A systems analyst needs solid technical knowledge, strong oral and written communication skills, good analytical ability, and an understanding of business operations and processes. A systems analyst needs good interpersonal skills to interact with people of all levels, from operation staff to senior executives, including people outside the company, such as software and hardware vendors, customers, and government officials. Often an analyst must lead an IT development team. State-of-the-art knowledge is extremely important in a rapidly changing business and technical environment. Analysts also maintain their skills by attending training courses, both on-site and online.

Certification

Many hardware and software companies offer certification for IT professionals. **Certification** verifies that an individual demonstrated a certain level of knowledge and skill on a standardized test.

Career Opportunities

The demand for systems analyst is expected to remain strong well into the twenty-first century. The responsibilities of a system analyst at a small firm are different from those at a large corporation.

Job Titles

First do not rely on job titles alone. Some positions are called systems analysts, but involve only programming or technical support.

Company Organization

Find out all you can about the company and where the IT department fits in the organization chart.

Company Size

If you like more variety, a smaller firm might suit you best. If you want to specialize, however, then consider a larger company with state-of-the-art systems.

Corporate Culture

In addition to having goals, methods, and information systems requirements, every firm has a underlying corporate culture. A corporate culture is the set of beliefs, rules, traditions, and values that define a company and influence its way of doing business.

Salary, Location, and Future Growth

Finally, consider the salary, location, and the company's prospects for future growth and success.

Want More Chapter Summaries and Guides, Go to:

http://the-computer-wizard.tripod.com/wizards-of-academics.html