信息系统分析与设计
Information Systems Analysis and Design

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Further Resources:

1. Ralph M. Stair and Georage W. Reynolds: *Principles of Information Systems (4th ed.)* , Course Technology, Inc., 1999

2. Robert Schlthweis, Mary Sumner: *Management Information Systems: The Manager's View*, McGraw-Hill Companies, 1998

3. John W. Satzinger, Robert B. Jackson and Stephen D. Burd: *Systems Analysis and Design in a Changing World (2nd Ed.)*, Course Technology, 2002

4. Satzinger, J. and ørivk, T.: *The Object-Oriented Approach: Concepts, System Development, and Modeling with UML (2nd Ed)*, Course Technology, 2001

5. Howard Eisner: *Essentials of Project and Systems Engineering Management,* John Wilsey and Sons, Inc., 1997

6. Booch G., Rumbaugh J. and Jacobson I.: *The Unified Modeling Language User Guide*, Addison Wesley Longman, Inc., 1999

7. 张海潘：*软件工程导论*(3rd ed.)，清华大学出版社，1998 [人民邮电出版，2002]

8. 黄梯云：*管理信息系统*，高等教育出版社，1999 [MIS导论，机械工业版，2002]

9. 萨师煊，王珊：*数据库系统概论（3th Ed.）*，高等教育出版社，2000

10. 宛延闿，定海：*面向对象分析和设计*，清华大学出版社，2001

Objective:

Although this course is oriented toward potential systems analysts, remember that systems analysis and design is not just about developing systems, but it is about solving business problem using information technology.

Ch1 信息系统(IS)概述

Ch1 概述

➢ **IS**是利用**IT**的一个解决方案
  ▪ 信息系统的初步认识**: Several concepts**
  ▪ 求解的问题对象**: System that solve business problems**
  ▪ 求解问题的人**:** 谁，解决问题的一般思路，所需的知识和技能

➢ **SDLC**简介**--**课程内容安排的思路
  ▪ 从软件工程的角度描述开发一个新信息系统的过程和方法

Overview--The information system as a solution

1. 信息系统的初步认识/**Overview of IS**

- 系统/**System**

    一组为实现一定目标而相互联系、相互作用的元素的集合/ **a collection of interrelated components that function together to achieve some outcome**

- 信息系统/**Information System**

    有关信息的收集、处理、存储和输出以完成一个组织所有事务的元素的集合/**a collection of interrelated that collect, process, store, and provide as output the information needed to complete business tasks**

- 子系统/**Subsystem**➜父系统/**Supersystem:** 含有若干子系统的系统
    系统中的相对独立的一个元素/**a system that is part of larger system**

- 系统功能分解/**Functional decomposition**

    按一定原则将系统分成若干个子系统，这些子系统还可进一步分成多个子系统/ **dividing a system into components based on subsystems that in turn are further divided into subsystems**

- 系统边界/**System boundary**

    系统和系统环境之间输入输出关系的形象分隔/**the separation between a system and its environment that inputs and outputs must cross**

Overview--The information system as a solution

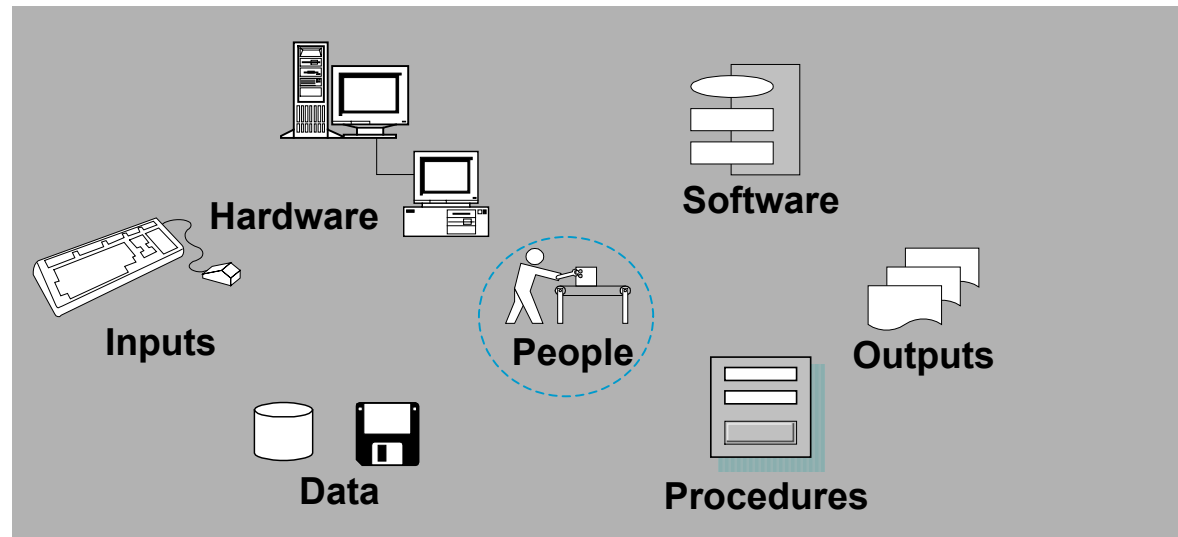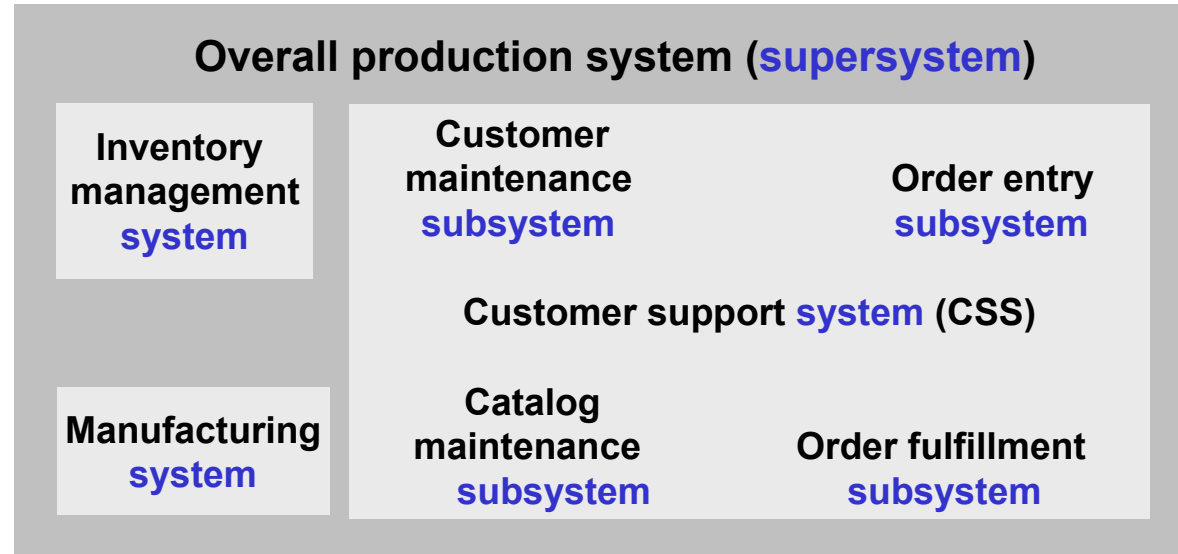**1.** 信息系统的初步认识/**Overview of IS**

ᨔ一个有关信息系统和子系统的例子

综合生产系统
- ➢库存管理系统
- ➢生产制造系统
- ➢客户支持系统**(CSS)**
  - ➢客户维护子系统
  - ➢订单录入子系统
  - ➢订单执行子系统
  - ➢产品目录维护子系统

ᨔ系统元素可考虑为相互作用的子系统↗

ᨔ系统元素的另一种理解方法是相互作用的各种事物➡

People are also key component in an IS

Overall production system (supersystem)

Inventory management system	**Customer maintenance subsystem**	**Order entry subsystem**
	Customer support system (CSS)	
Manufacturing system	**Catalog maintenance subsystem**	**Order fulfillment subsystem**

Hardware

Software

Inputs

People

**Data**

Procedures

Outputs

Overview--The information system as a solution

1. 信息系统的初步认识**/Overview of IS**

• 系统自动边界**/Automation boundary**

系统内自动部分和手动部分的形象分隔 **/ the separation between the automated part of a system and the manual part of a system**

&**System boundary vs. Automation boundary**

Environment surrounding the system

Manual part of the system

Automation part of the system

System boundary ◄

Automation boundary ◄
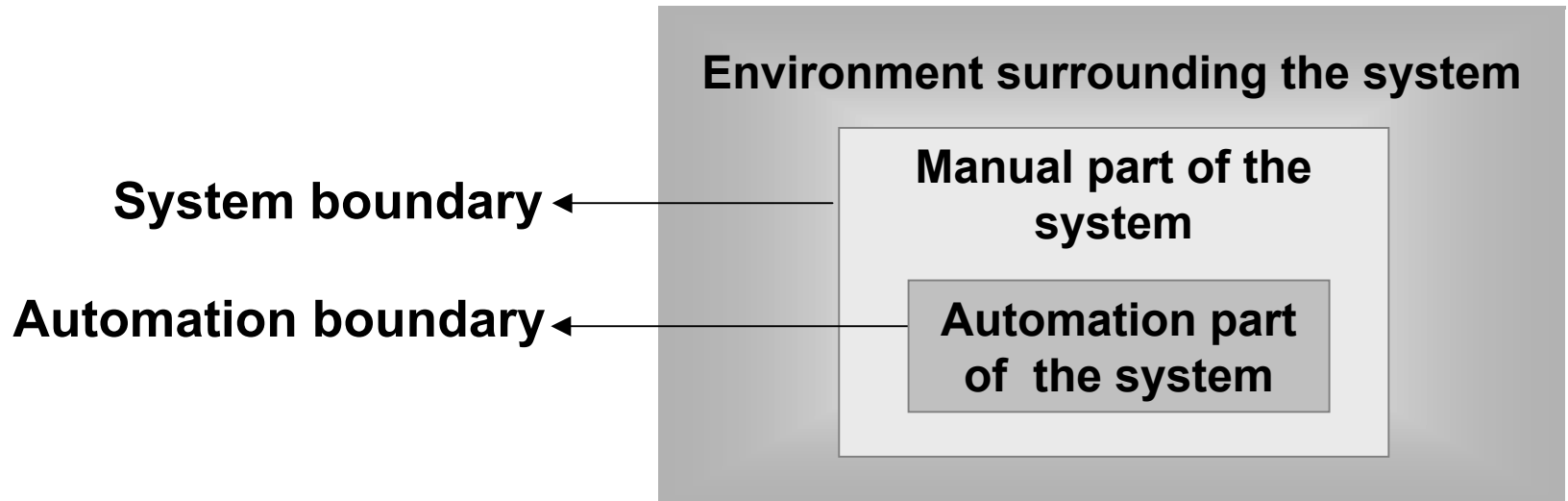
Overview--The information system as a solution

2. 求解的问题对象/**The solving-problem**
- 任何类型的组织**[vs. business organization]   [IS-软件vs. 其它软件]**
  manufacturing, retailing, financial services, even as aerospace
- 目标/**The objective**

  应用现代技术使组织的运作更具效率、有效性和竞争力 / **takes advantage of *Information Technology* to make it run *efficiently*, *effectively* and *competitively***

3. 求解问题的人**--**系统分析员**The analyst is as a business problem solver**

  Note **A systems analyst is often thought of as a problem solver rather than a programmer**➜系统分析员公认为是优于程序员的问题解决者
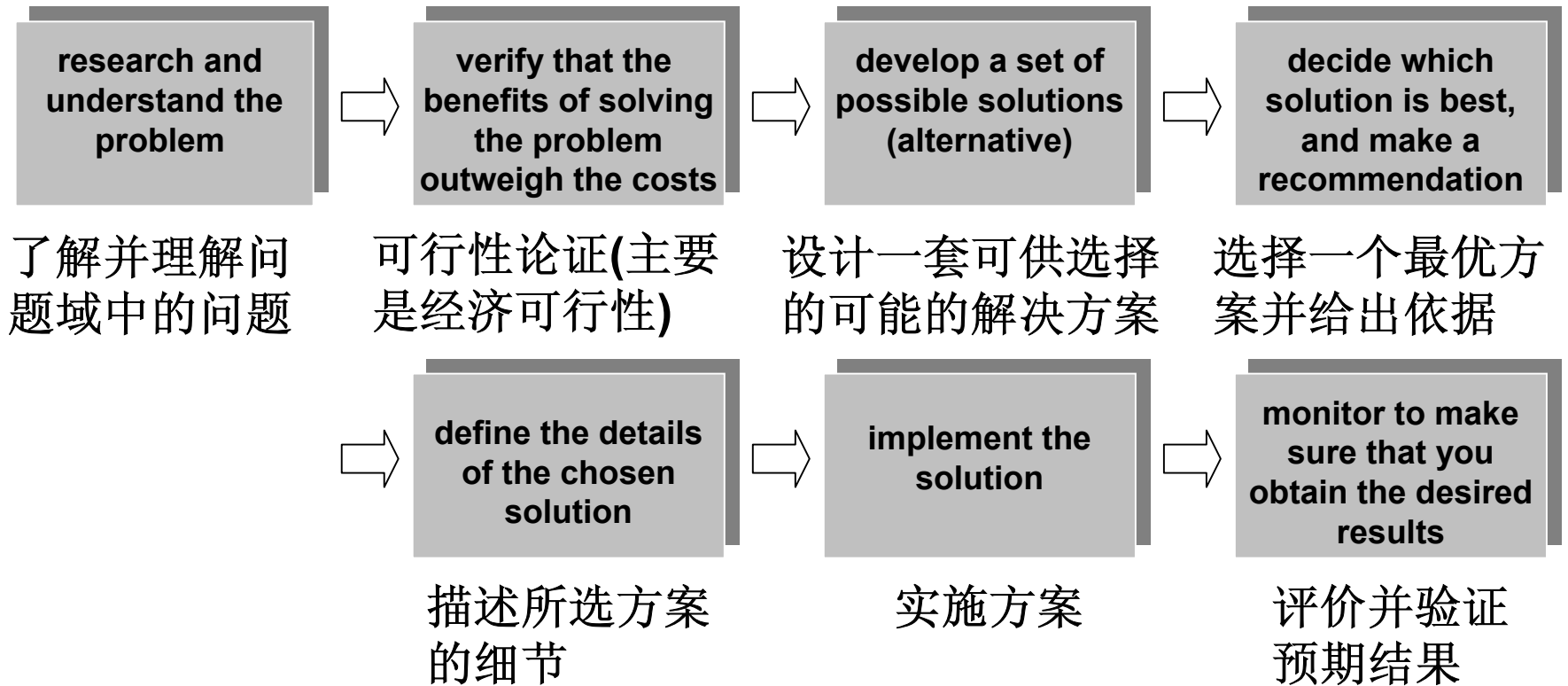- 系统分析员的一些其它常见称呼/**some job titles you may encounter**
  - 首席信息官**CIO/Chief Information Officer**
  - 项目经理/**Project Manager**
  - 系统设计师/**System Designer**
  - 系统架构设计师/**System Architect**
  - 软件工程师/**Software Engineer**
  - 系统顾问/**Systems Consultant**
  - 终端用户分析员/**End-user Analyst**
  - 程序分析员/**Programmer Analyst**

他们有时以独立承包人**(independent contactor)** 的形式为软件开发公司、咨询公司服务

Overview--The information system as a solution

3. 求解问题的人**--**系统分析员**The analyst is as a business problem solver**
  • 系统分析员求解问题的一般思路**/The analyst's approach to problem solving**

| research and understand the problem | | verify that the benefits of solving the problem outweigh the costs | | develop a set of possible solutions (alternative) | | decide which solution is best, and make a recommendation |

了解并理解问题域中的问题　可行性论证(主要是经济可行性)　设计一套可供选择的可能的解决方案　选择一个最优方案并给出依据

| define the details of the chosen solution | | implement the solution | | monitor to make sure that you obtain the desired results |

描述所选方案的细节　　实施方案　　评价并验证预期结果

Overview--The information system as a solution

3. 求解问题的人**--系统分析员The analyst is as a business problem solver**

- 系统分析员所需的知识、技能/**Required skills of the systems analyst**
  - ➢技术方面的知识和技能/**Technical Knowledge and Skills**   ▶
  - ➢有关组织的业务知识及管理技能/**Business Knowledge and Skills** ▶
  - ➢人际关系及协调技能/**People Knowledge and Skills**   ▶
  - ➢诚信和道德/**Integrity and Ethics**

★不断更新知识和技能对从事信息系统开发的每一个人都很重要，否则他将被淘汰/**It is important for everyone involved in information system development to upgrade their knowledge and skills continually, otherwise he will be left behind.**

▶

Overview--The information system as a solution

3. 求解问题的人**--**系统分析员**The analyst is as a business problem solver**

· 系统分析员所需的知识、技能/**Required skills of the systems analyst**

➤ 技术方面的知识和技能/**Technical Knowledge and Skills:** ①基本技术

①基本技术/**fundamentals**
②开发工具
③开发技术

✓ 计算机及其工作原理/**Computers and how they work**

✓ 相关外围设备/**Devices that with computers, including input devices, storage devices, and output devices**

✓ 通信及网络技术/**Communications networks that connect computers**

✓ 数据库与数据库管理系统/**Database and database management systems**

✓ 程序设计语言/**Programming languages**

✓ 操作系统及其实用程序/**Operating systems and utilities**

★**what they are used for**
★**how they work**
★**how they are evolving**

Overview--The information system as a solution

3. 求解问题的人**--系统分析员The analyst is as a business problem solver**
 • 系统分析员所需的知识、技能**/Required skills of the systems analyst**
  ➢技术方面的知识和技能**/Technical Knowledge and Skills:**
   ②开发工具**/tools**

✓软件包**/Software packages such as Microsoft Access and PowerBuilder that can be used to develop systems**
✓软件开发环境**(IDEs)/Integrated development environments (IDEs) for specific programming languages, such as Sun Java Workshop or Microsoft Visual C++ or Visual Basic etc**
✓**CASE**工具**/Computer-aided system engineering (CASE) tools**
✓其它自动工具**/Program code generators, testing tools, software library management tools, documentation support tools, project management tools, and so on**

★**Even if an analyst is not involved in programming duties, it is still crucial to have an understanding to those tools and techniques**

Overview--The information system as a solution

3. 求解问题的人**--**系统分析员**The analyst is as a business problem solver**

• 系统分析员所需的知识、技能**/Required skills of the systems analyst**

➢技术方面的知识和技能**/Technical Knowledge and Skills:**

③开发技术**/techniques**

✓项目计划技术**/Project planning techniques**
✓系统分析技术**/Systems analysis techniques**
✓系统设计技术**/Systems design techniques**
✓系统构造与实施技术**/System construction and implementation techniques**
✓系统支持技术**/System support techniques**

★ **The objective of this course that you are taking is to teach you state-of-the-art concepts, techniques, and skills that you will use in the development of new information systems for today's organizations and make you be a successful systems analyst.**/该课程的主要目的就是讨论最新的与信息系统有关的知识及支持信息系统开发过程的技术，为成为一个合格的系统分析员打下一些基础。

Overview--The information system as a solution

3. 求解问题的人**--**系统分析员**The analyst is as a business problem solver**

• 系统分析员所需的知识、技能/**Required skills of the systems analyst**

➢ 有关组织的业务知识及管理技能/**Business Knowledge and Skills**

The following are examples:

✓ 一个组织的业务及其流程/**What activities and processes do organizations perform?**

✓ 组织机构的形式/**How are organizations structured?**

✓ 组织的管理模式/**How are organizations managed?**

✓ 业务工作的类型/**What type of work goes on in organizations--- for example, finance, manufacturing, marketing, customer service, and so on?**

★ **In fact, computer information systems (CIS) or MIS majors are often included in the college of business. Or, the business administration such as accounting, marketing operations, and management course are taken in a CIS or MIS degree program. /CIS**或**MIS**是一些西方国家大学商学院的主修课程，或者在**CIS**或**MIS**专业学位培养计划中需修有关商业管理方面的课程，如会计学、市场营销、管理学等。

Overview--The information system as a solution

3. 求解问题的人**--**系统分析员**The analyst is as a business problem solver**

· 系统分析员所需的知识、技能/**Required skills of the systems analyst**

➢人际关系及协调技能/**People Knowledge and Skills**

信息系统的开发是一个团队性的**(**组织的用户**&**开发小组的成员**)**工作：

✓尊重他人的思维习惯/**How people think**
✓了解他人面对"变化"的反应/**How people react to change**
✓善于沟通/**How people communicate**

➢诚信和道德/**Integrity and Ethics**

系统分析员在建设**IS**过程中，会涉及到一个组织的各个部门的所有信息，特别：

✓保密、绝密信息，如销售策略、战略计划、安全防范措施等
✓个人资料，如薪水、健康、工作表现等私隐

★**Any appearance of impropriety can destroy an analyst's career/**
任何不正当的行为都会毁掉你的前程
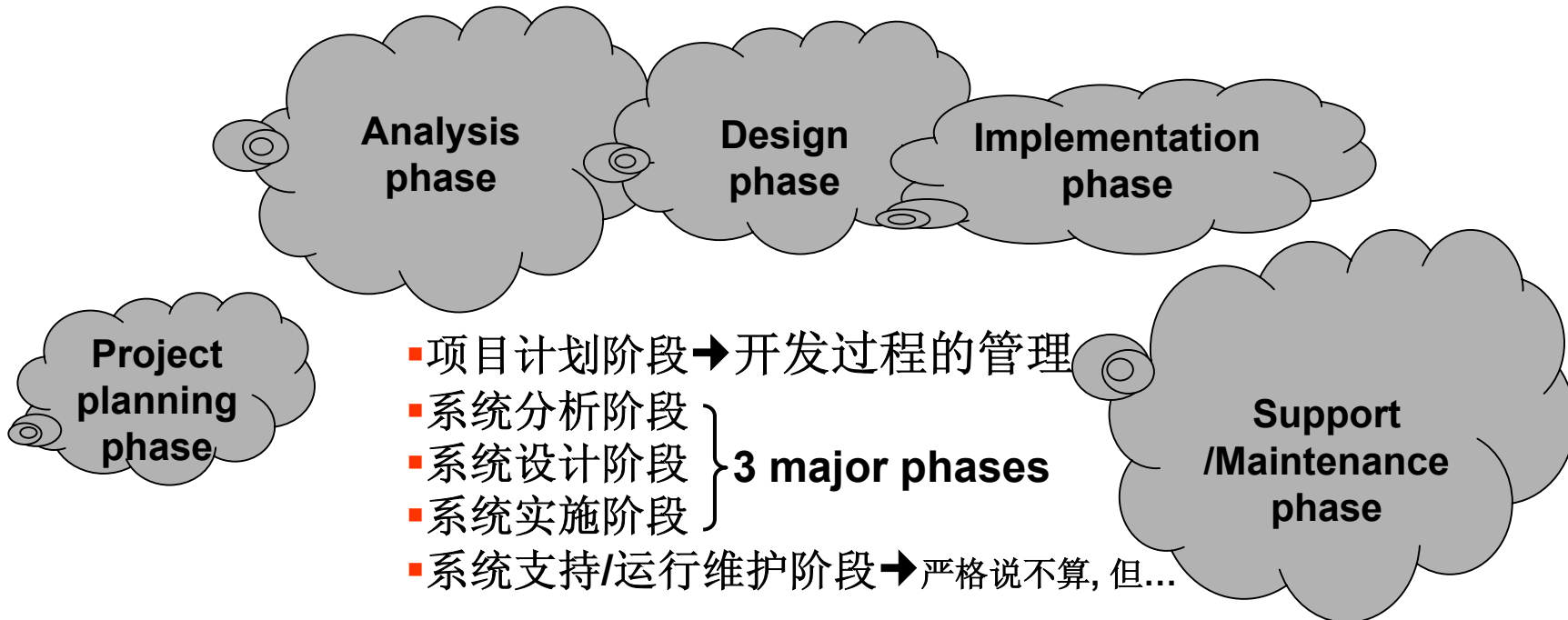
SDLC--the Systems Development Life Cycle

1. SDLC是一个通用的术语

• **SDLC(**系统开发生命周期**)**用于描述开发一个新的**IS**的方法和过程**/ SDLC is the general term that is used to describe the method and process of developing a new information system.**

• **SDLC** 〈 过程性➡通常由**5**个阶段**(phase)**构成➡活动**(activity)**➡任务

方法学➡如何支持所有活动**/**任务的完成➡模型、工具、技术

2. 系统的生命周期**—**过程性

• 任何**IS**的开发都至少要求三个阶段

Analysis phase

Design phase

Implementation phase

Project planning phase

Support /Maintenance phase

▪ 项目计划阶段➡开发过程的管理
▪ 系统分析阶段 ⎫
▪ 系统设计阶段 ⎬ **3 major phases**
▪ 系统实施阶段 ⎭
▪ 系统支持**/**运行维护阶段➡严格说不算, 但…

SDLC--the Systems Development Life Cycle

2. 系统的生命周期—过程性

•项目计划阶段/**Planning phase**

目标/**objective: (SDLC**的最初阶段**)**确定项目范围并作出项目有关计划

活动/**activities:** ➢定义问题/**Define the problem**

➢确定项目的可行性/**Confirm project feasibility**

➢制定项目的进度计划表/**Produce the project schedule**

➢项目成员的安排/**Staff the project**

➢项目启动/**Launch the project**

SDLC--the Systems Development Life Cycle

2. 系统的生命周期—过程性

•系统分析阶段/**analysis phase**

目标：了解并理解用户需求以及定义需求**(discovery & understanding & analysis)**➜构造新系统的逻辑模型

活动：➢获取需求信息/**Gather information (from the problem domain)**
➢定义系统需求/**Define system requirements**
➢确定系统的优先级/**Prioritize requirements**
➢制定并评估可供选择的解决方案/**Generate and evaluate the alternative solutions**
➢阶段工作的复查与评审/**Review recommendations with management**

SDLC--the Systems Development Life Cycle

2. 系统的生命周期**—**过程性

•系统设计阶段**/design phase**

目标：从实现角度设计系统的解决方案➡构造新系统的物理模型

活动：➢网络的设计与集成**/Design and integrate the network**

➢应用程序体系结构的设计**/Design the application architecture**

➢模块的详细设计**/The detailed algorithms and data structures**

➢数据库的设计与集成**/Design and integrate the database**

➢系统控制及I/O的设计**/Design the system controls and I/O**

➢人机界面的设计**/Design the user interfaces**

SDLC--the Systems Development Life Cycle

2. 系统的生命周期**—**过程性

• 系统实施阶段/**implementation phase**

目标：构造一个可靠的可工作的新系统

活动：➢ 确定一个合适的程序开发顺序/**Choose an appropriate approach to program development**

➢ 软件编码和调试/**Code and debug software components**

➢ 软件测试/**Software testing**

➢ 数据转换与系统安装/**Convert data and install the system**

➢ 文档和培训/**Document and training**

SDLC--the Systems Development Life Cycle

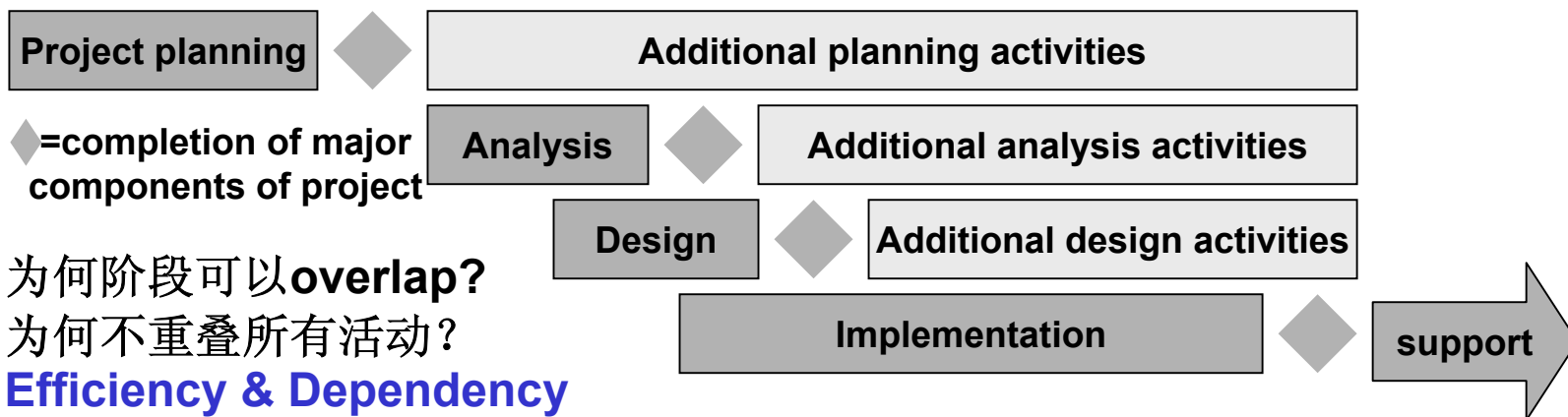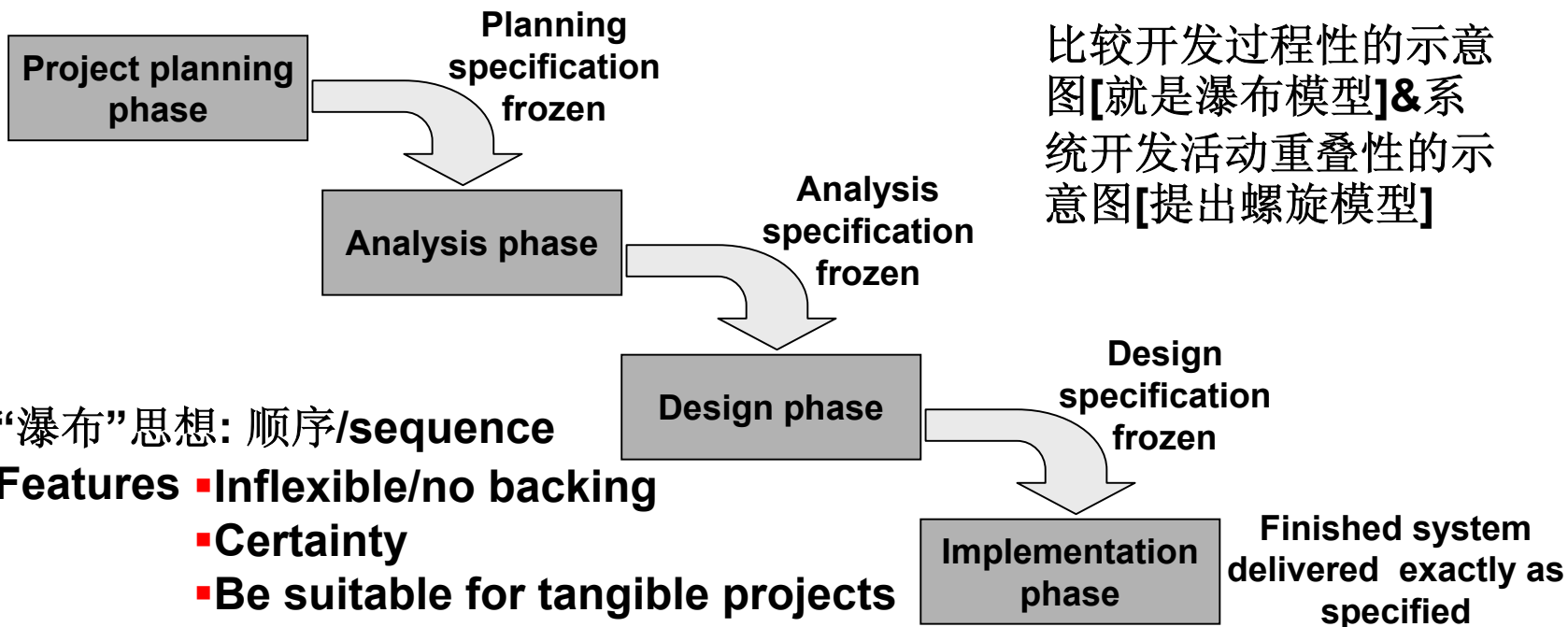**2.** 系统的生命周期**—**过程性

• 系统运维阶段**/support phase**

目标：保证系统的长期高效运行**/keeping it running productively**

活动：➤提供对终端用户的支持**/Providing support to end-users**

➤维护**(bug fixes)**和升级**(**增强**)**计算机系统**/ Maintaining and upgrading (enhancing) the computer system**

SDLC--the Systems Development Life Cycle
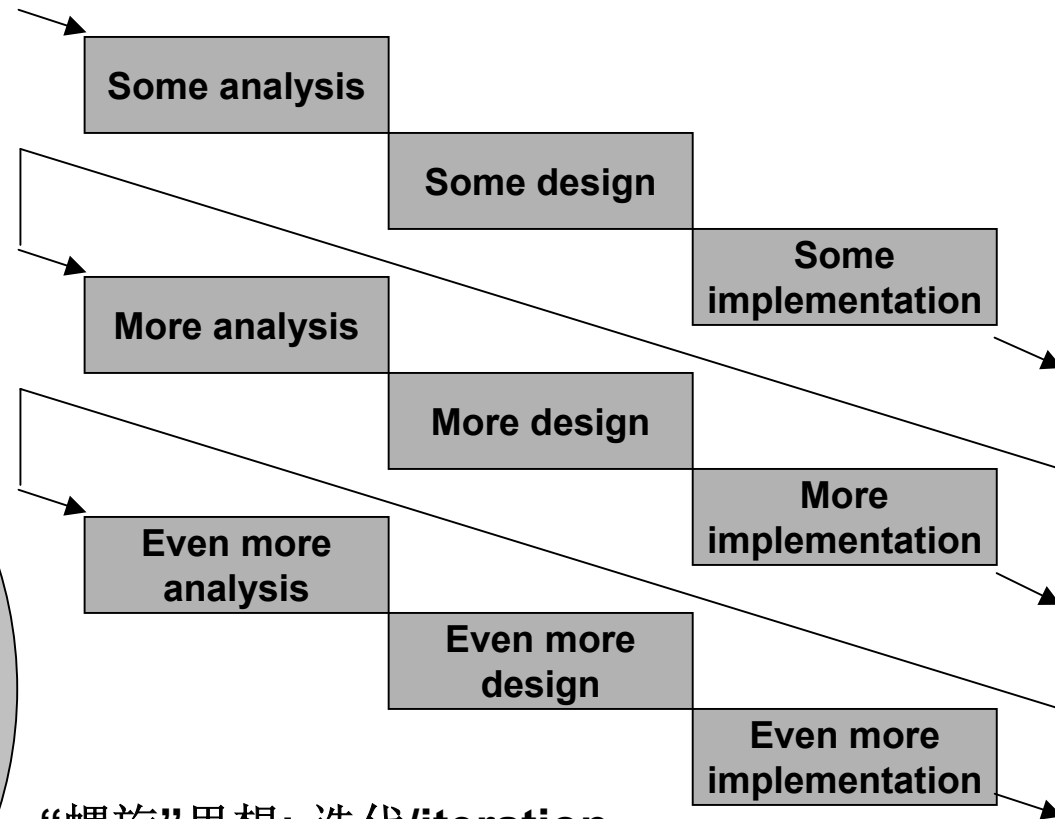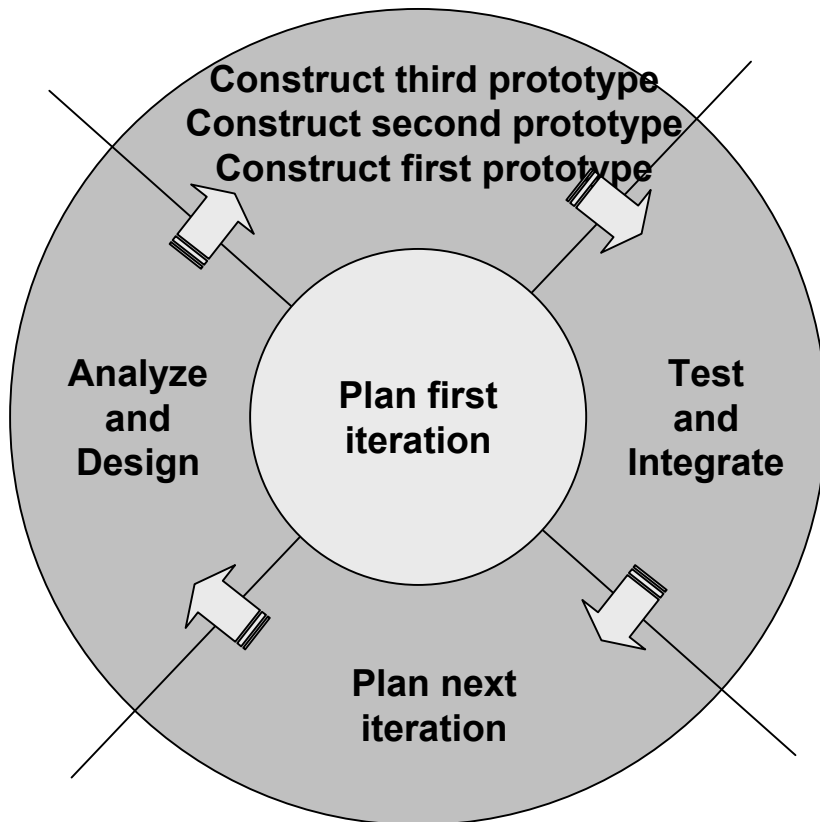
3. 开发过程性的进一步认识**—SDLC**的变体**(variation)**

•**"瀑布"模型(waterfall model)**与**"螺旋"模型(spiral model)**

Project planning phase

Planning specification frozen

比较开发过程性的示意图**[**就是瀑布模型**]&**系统开发活动重叠性的示意图**[**提出螺旋模型**]**

Analysis phase

Analysis specification frozen

Design phase

Design specification frozen

"瀑布"思想: 顺序/sequence

Features ▪**Inflexible/no backing**

▪**Certainty**

▪**Be suitable for tangible projects**

Implementation phase

Finished system delivered exactly as specified

Project planning

◆ **Additional planning activities**

◆**=completion of major components of project**

Analysis

◆ **Additional analysis activities**

Design

◆ **Additional design activities**

为何阶段可以**overlap?**
为何不重叠所有活动？
Efficiency & Dependency

Implementation

◆ **support**

SDLC--the Systems Development Life Cycle

3. 开发过程性的进一步认识**—SDLC**的变体**(variation)**

•"瀑布"模型**(waterfall model)**与"螺旋"模型**(spiral model)**

Some analysis

Some design

Some implementation

More analysis

More design

More implementation

Even more analysis

Even more design

Even more implementation

Construct third prototype
Construct second prototype
Construct first prototype

Analyze and Design

Plan first iteration

Test and Integrate

Plan next iteration

"螺旋"思想: 迭代/**iteration**

Features ▪**Reduces the risk**
▪**Shorten development schedules**
▪**Be difficult to manage a project**

SDLC--the Systems Development Life Cycle

4. 系统开发方法学/**methodology**

•系统开发方法学的定义

A **system development methodology** (**homegrown or purchased**) **provides comprehensive guidelines to follow for completing every activity in the SDLC, including specific models, tools, and techniques/**提供对完成系统开发生命周期中的每一个活动的详细指导，包括具体的模型、工具和技术。

几种常见的开发方法
  ➢结构化方法/**Structured approach**
  ➢面向对象方法/**Object-oriented approach**
  ➢原型化方法/**Prototyping approach**
  ➢信息工程方法/**Information engineering approach**

•系统开发方法学和系统开发过程性的关系
所有的开发方法都支持**SDLC**的过程性，只不过不同的开发方法所用的模型、技术、工具不同而已

SDLC--the Systems Development Life Cycle

4. 系统开发方法学/**methodology**

  •模型/**models**

  Models is a representation of some important aspect of the real world/模型是对现实世界某些重要方面的抽象表示。

  ①**Abstraction** ②**Diagrams or Charts or Symbols**

  系统开发中使用的一些模型:

> **Some models used in system development**
>   数据流程图/**Data flow diagram(DFD)**
>   实体-关系图/**Entity-relationship diagram(ERD)**
>   模块结构图/**Module structure chart**
>   用例图/**Use case**
>   类图/**Class diagram**
>   交互图/**Interaction diagram**
> **Some models used to manage the development process**
>   PERT图、甘特图/**PERT chart, Gantt chart**
>   组织结构图/**Organizational hierarchy chart**
>   财务分析模型/**Financial analysis models--NPV, ROI**

SDLC--the Systems Development Life Cycle

4. 系统开发方法学**/methodology**

•工具**/tools**

Tools is software support that helps create models or other components required in the project/工具通常表现为软件支持的方式，用来辅助形成系统开发所需模型或其它组成成份。

系统开发中使用的一些工具:

Some tools used in system development
项目管理应用程序**/Project management application**
绘图**/**图形应用程序**/Drawing/graphics application**
字处理**/**文本编辑器**/Word processor/text editor**
CASE工具**/CASE tools**
集成开发环境**/IDEs**
数据库管理应用程序**/DBMS application**
代码生成器**/Code generator**

SDLC--the Systems Development Life Cycle

4. 系统开发方法学/**methodology**

•技术/**techniques**

Techniques is a collection of guidelines that help the analyst complete a system development activity or task/技术是用来指导系统开发人员完成系统开发活动或任务的一系列方法。

系统开发中使用的一些技术:

Some techniques used in system development
项目管理技术/**Project management techniques**
和用户会谈技术/**User interviewing techniques**
结构化分析、设计技术/**Structured analysis and design technique**
OO分析、设计技术/**Object-Oriented …**
数据库设计技术/**Database design techniques**
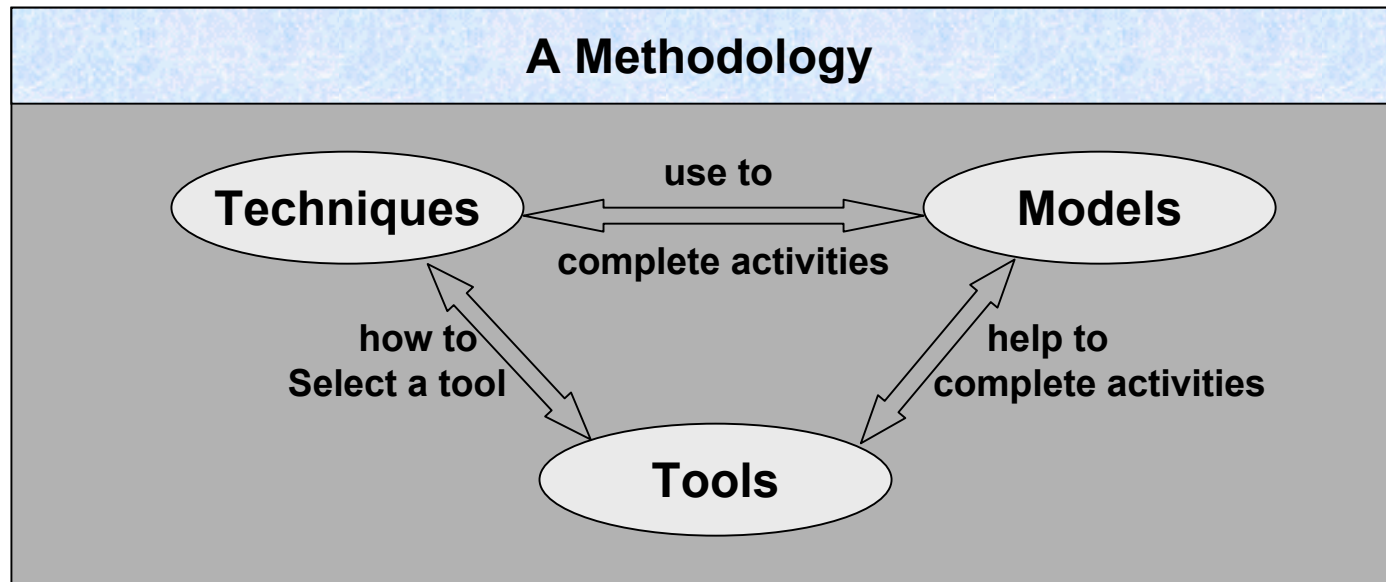编程技术/**Coding techniques**
软件测试技术/**Software-testing techniques**

SDLC--the Systems Development Life Cycle

4. 系统开发方法学/**methodology**

　　•系统开发方法学小结/**Summary of methodology**

多种技术、模型和工具**(Techniques, Models and Tools)**的集合构成了一个方法(方法学)**(Methodology)**。技术用来支持实现**SDLC**中各阶段的活动或任务**(Activities/Tasks)**；活动/任务的完成必需借助于相关的工具；用模型表示各阶段活动的工作成果**(Outcome).**

A Methodology

Techniques —— use to complete activities —— **Models**

how to Select a tool

help to complete activities

Tools

SDLC--the Systems Development Life Cycle

5. 系统开发生命周期小结/**Summary of SDLC**

•两个关键文档/**2 key documents**

➤逻辑模型 描述系统需求而无需涉及其实现细节的模型/**Logical model shows what the system is required to do without committing to any one technology**

➤物理模型 描述系统面向实现的解决方案的模型/**Physical model shows how the system will actually be implemented**

Analysis phase		Design phase
What to do		How to do
Logical model		Physical model
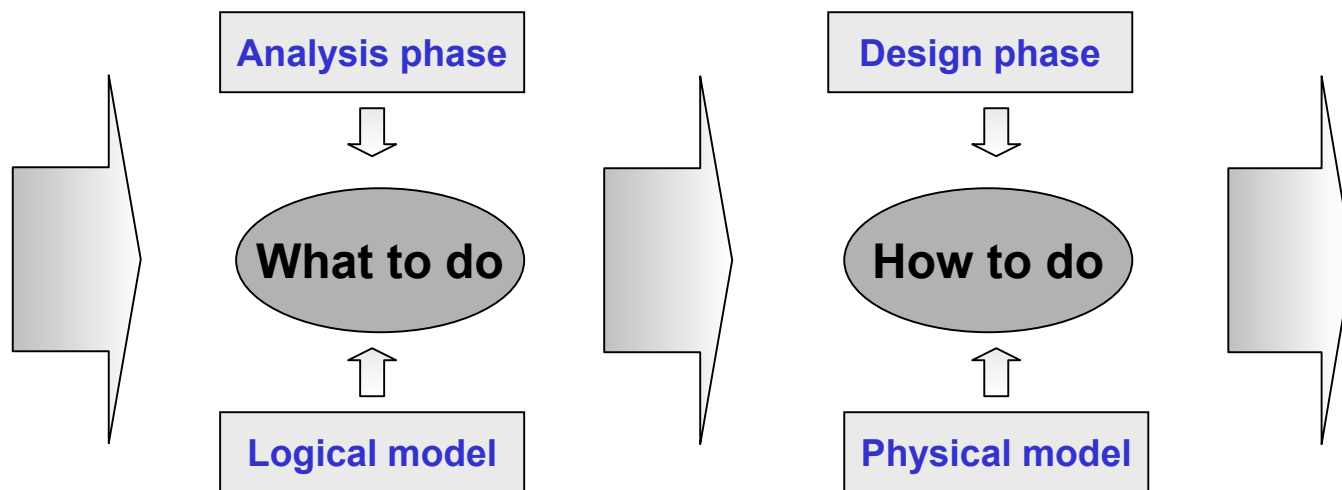
Overview of the course

Ch1 信息系统概论
- 信息系统的初步认识
- 系统分析员—信息系统的求解者
- 信息系统的开发—**SE**的观点

Ch2 相关概念、原理及技术基础
- 数据和信息|管理|系统|组织|**IS**
- 信息系统的技术支柱

Ch3 信息系统的开发方法
- 结构化方法
- 快速原型化方法
- 面向对象方法
- 开发方法的选择或重构
- **CASE**及**CASE**工具

Ch4 系统开发开发的组织和管理工作
- 项目与项目管理概述
- 信息系统项目计划的任务
- 信息系统的质量保证

Ch5 系统分析的任务
- 系统分析任务的概述
- 系统需求的获得
- 建模的基础: 模型、事件、事物
- 结构化的需求定义方法
- 面向对象的需求定义方法
- 系统的解决方案及其决策

Ch6 系统设计的任务
- 系统设计概述
  - 应用程序体系结构的设计—结构化方法
  - 应用程序体系结构的设计—面向对象方法
- 数据库设计
- 系统控制及其输入、输出设计
- 用户界面设计

Ch7 系统实施、转换和维护
- 程序开发
- 质量保证－软件测试
- 系统的安装与转换
- 系统的用户文档与培训
- 系统的运行维护

Ch1 思考题

1. 描述一个你愿意了解并去解决的有关信息管理方面的问题，并构想如何应用信息技术来帮助解决这个问题？
2. 假如你将来要从事系统分析员这个职业，了解并关注相关公司招聘雇员时有哪些关键的技能要求？信息管理与信息系统专业毕业生应具何能力长处？
3. 你是如何理解软件开发方法学的(或者"软件系统的开发无非就是就是编程"这句话对吗)？询问或访问几个国内外信息系统开发公司 / 信息系统咨询公司的网站，了解他们用于开发系统的方法，他们是如何认识**SDLC**的？