

北京航空航天大学  
BEIHANG UNIVERSITY

# Business Analysis

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# Review

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- Understand a Problem
  - Scope Definition (确定范围)
  - Problem Analysis (分析问题)
  - Context Diagram (范围图)
- Resolve a Problem
  - The Model Driven Development Strategy (模型驱动开发策略)
  - The Rapid Application Development Strategy (快速应用开发策略)
  - The Commercial Application Package Implementation Strategy (商业应用程序包实施策略)
  - Hybrid Strategies (混合策略)

**如果是大系统，在系统业务分析之前要进行  
信息资源规划**

# 信息资源规划

- 信息资源与人、财、物资源一样，都是企业的重要资源，因此，应该像管理其他资源一样管理信息资源；
- 信息资源规划是指对企事业单位或政府部门信息的采集、处理、传输和使用的全面规划。
- 信息资源规划运用先进的信息工程和数据管理理论及方法，通过总体数据规划，打好数据管理和资源管理的基础，促进实现集成化的应用开发。

先进信息资源规划理论有霍顿(F.W.Horton)信息资源管理(IRM)理论、威廉·德雷尔(William Durell)数据管理(DA)理论和詹姆斯·马丁(James Martin)信息工程方法论(IEM)等。詹姆斯·马丁举出的典型案例是上世纪80年代初的一家大型商业银行，通过总体数据规划得出21个主题数据库。有了这些数据库后，该企业所有的数据处理工作都可以在这些数据库的基础上进行。企业过程可以分为两类：一类是日常业务过程处理和简单查询，它们都是一些共享数据库存取操作；另一类是更为高级的信息系统，它们需要复杂的数据库应用。一旦这些主题数据库投入使用，并且利用适当的查询语言和数据分析预测软件，就可以支持银行的全部业务工作，特别是中高层的经营管理工作。

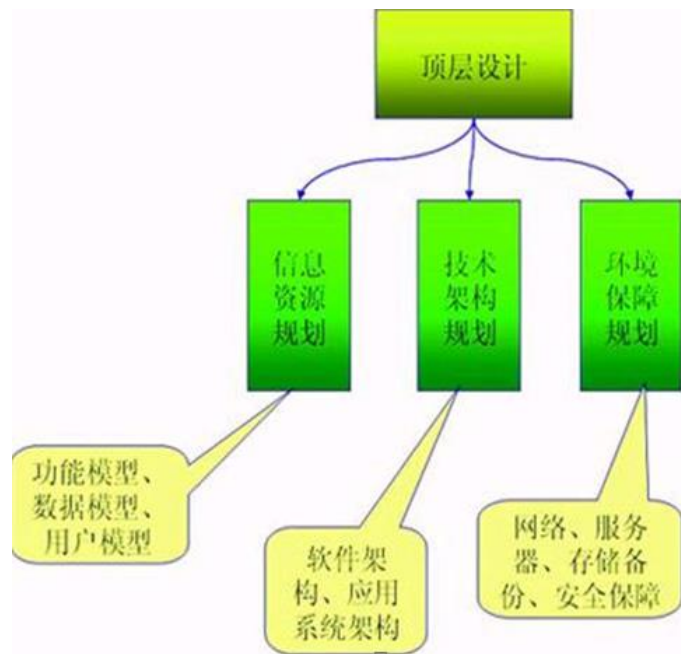
# 信息资源规划

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- 信息资源管理目的是通过企业内外信息流畅通和信息资源的有效利用，来提高企业效益和竞争力。搞好企业信息资源管理的前提是搞好信息资源规划。以制造业为例，不论产品设计、材料配件采购、加工制造和总装，还是销售和客户服务等等过程，无不充满着信息的产生、流通和运用。要使每个部门内部，部门之间，部门与外部单位的频繁、复杂的信息流畅通，充分发挥信息资源的作用，不进行统一的、全面的规划是不可能的。因此，从某种意义上说，信息资源规划从根本上解决“信息孤岛”问题。

# 企业信息资源规划要点

- 总体数据规划过程中建立信息资源管理基础标准，从而落实企业数据环境的改造或重建工作。
- 工程化的信息资源规划实施方案，在**需求分析**和**系统建模**两个阶段规划过程中执行有关标准规范。
- 全面利用软件工具支持信息资源规划工作，将标准规范编写到（“固化到”）软件工具之中，软件工具就会引导规划人员执行标准规范，形成以规划元库（Planning Repository）为核心的计算机化文档，确保与后续开发工作的无缝衔接



信息资源规划主要是根据主流业务分析

# 企业信息资源规划要点

- **以数据为中心**的系统集成，建立主题数据库。如果把分析信息系统集成问题的着眼点放在信息流上，通过信息流将企业各部门的主要功能串起来，而不是根据现有部门的功能来考虑信息系统的集成问题，就可以建立起稳定、灵活的全企业集成化信息系统模型。
- 数据结构是稳定的，处理是多变的。建立面向业务主题建库（不是面向单证报表建库）。主题数据库有特征：
  - （1）支持信息共享；
  - （2）要求所有源数据一次一处输入系统（不是多次多处输入）；
  - （3）每个主题数据库都由基本表构成，基本表具有原子性（表中的数据项是数据元素）、演绎性（可由表中的数据生成全部输出数据）和规范性（表中数据结构满足三范式要求）。

信息集成是两个或两个以上的相对独立的实体（可独立运行）在功能、信息、资源、组织等方面衔接起来，成为统一的整体。

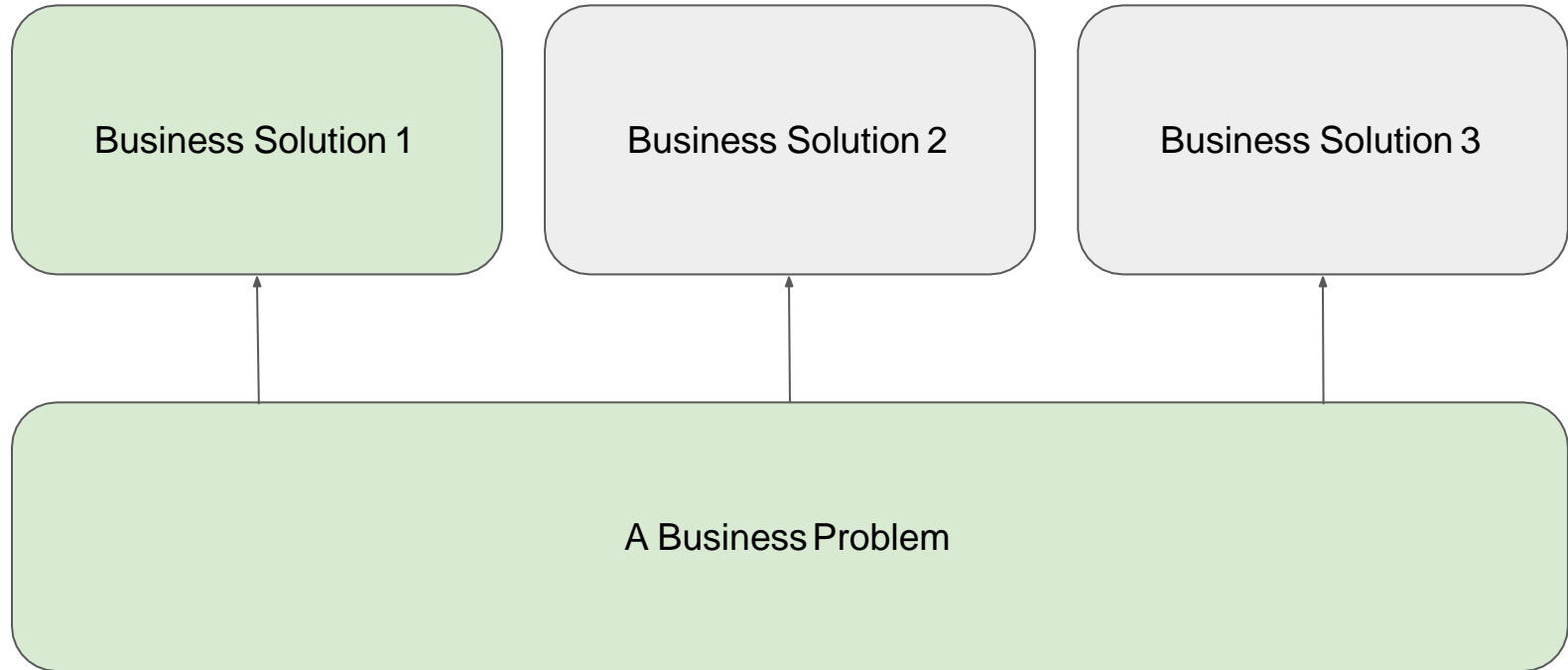
集成分物理集成、信息集成、功能集成。物理集成是指设备（包括计算机）的网络联通。信息集成是指通过数据库互相存取信息。功能集成是指系统之间各功能的协调运行。

# Project Scope VS System Boundary

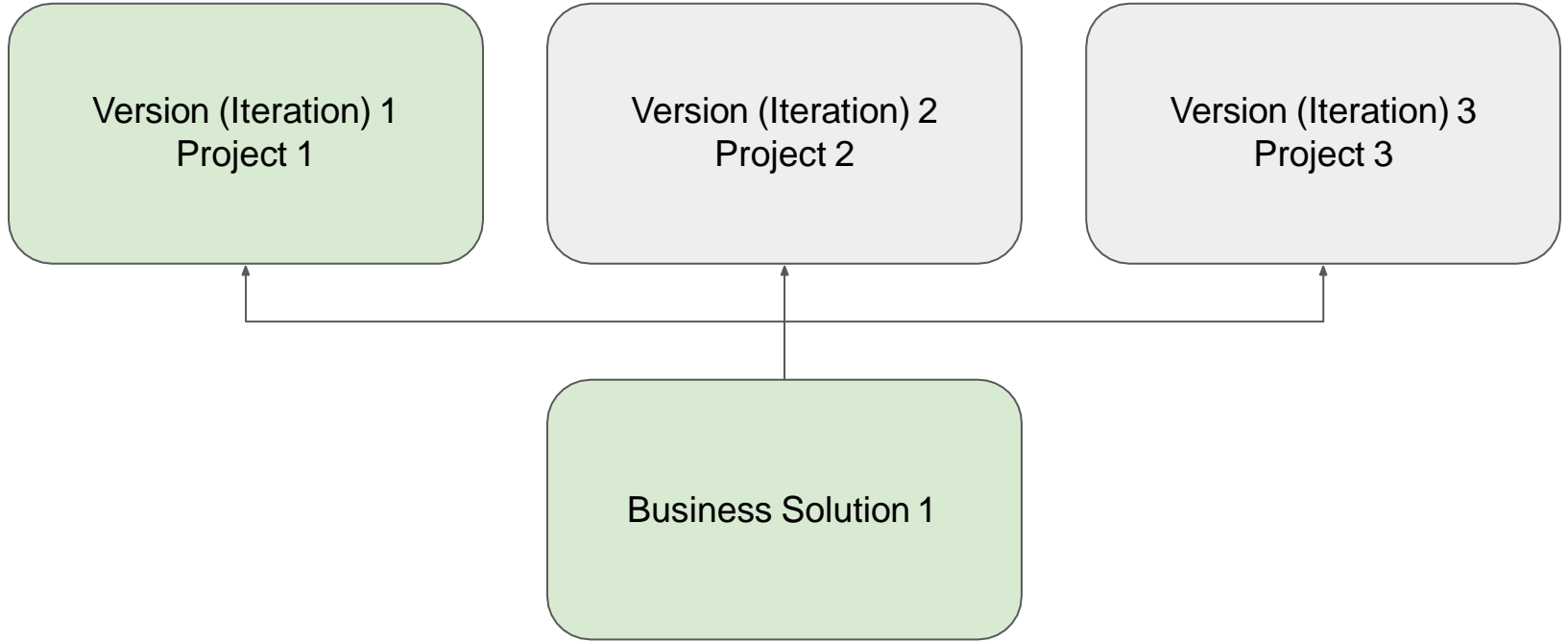
(项目范围VS系统边界)



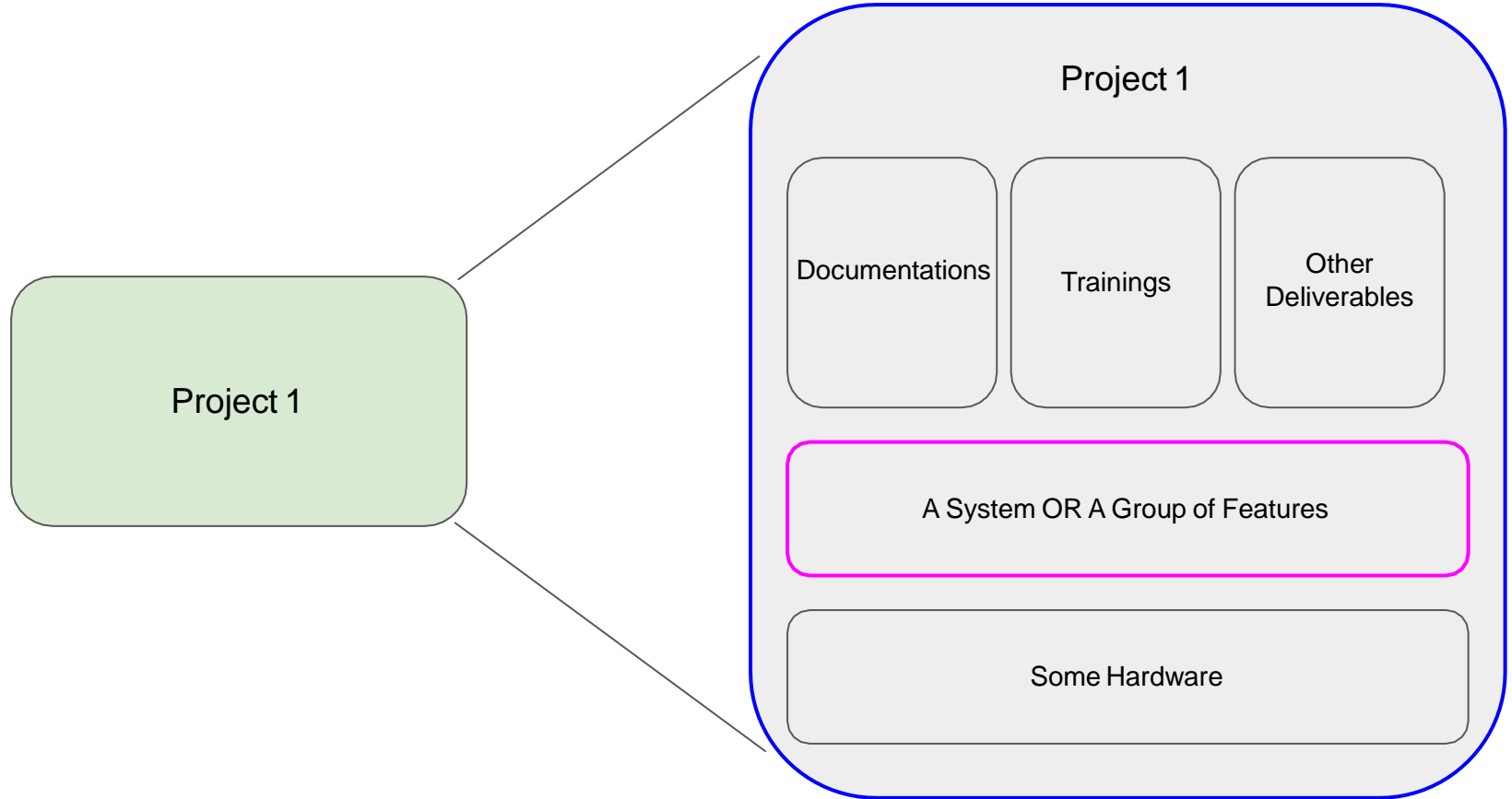
# A Business Problem



# A Business Problem



# A Business Problem

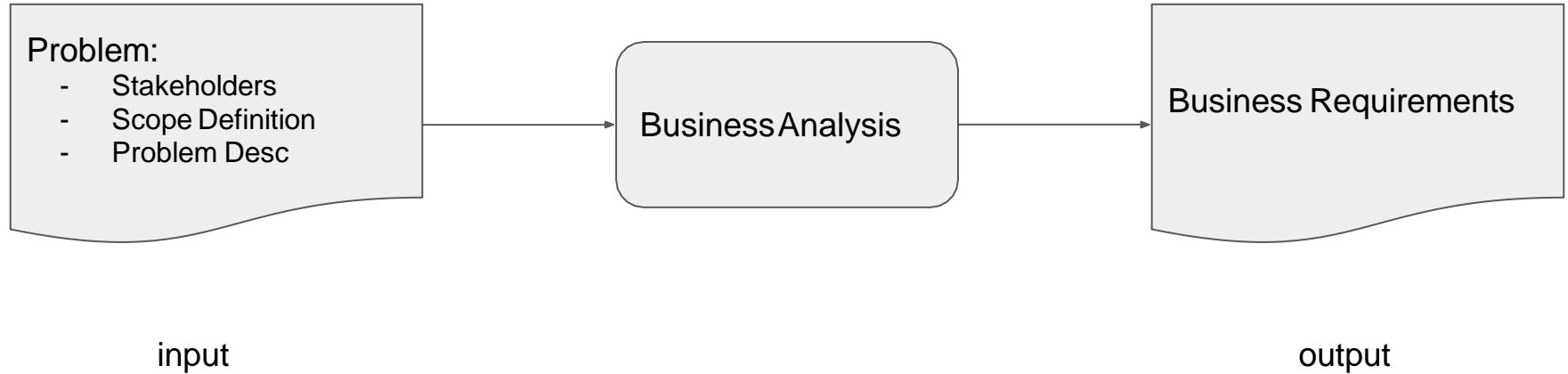


# Business Analysis

(业务分析)

# I/O of Business Analysis

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# Activities in Business Analysis

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- Requirements Discovery (发现需求)
- Documenting and Analyzing Requirements (记录和分析需求)

# Requirements Discovery (发现需求)

# Requirements

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- **System Requirement** (a.k.a. **Business Requirement**) - something that the IS must do or a property that it must have.  
(系统需求 (又称业务需求) —— 信息系统必须要做的事或它必须拥有的属性)
- **Functional Requirement** - something that IS must do.  
(功能需求-信息系统必须要做的事情)
- **Nonfunctional Requirement** - a property or quality that system must have. Examples include security, ease-of-use, performance, etc.  
(非功能需求-系统必须具有的特性, 包括安全性、易用性、性能等)



# System Requirements Criteria

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- Consistent - the reqs are not conflicting or ambiguous (一致性)
- Complete - the reqs describe all possible system inputs and responses (完整性)
- Feasible - the reqs can be satisfied based on the available resources and constraints (可行性)
- Required - the reqs are truly needed and fulfill the purpose of the system (必要性)
- Accurate - the reqs are stated correctly (准确性)
- Traceable - the reqs directly map to the functions and features of the system (可追溯)
- Verifiable - the reqs are defined so that they can be demonstrated during testing (可验证)

# Fact Finding Techniques

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- Sampling of existing documentation, forms and databases (现有文件, 表格和数据库的抽样调查)
- Research and site visits (实际考察与研究)
  - Market Research
  - Competitor Research
- Observation of the work environment (检查工作环境)
- Questionnaires (问卷调查)
- Interviews (面谈)
- Discovery prototyping (发现原型)
- Joint requirements planning (JRP) (联合需求计划)

# Describe Requirements

(需求描述)

# Product Requirement Document

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- Key Points
  - Business problem to solve (要解决的业务问题)
  - Stakeholders (利益相关者)
  - Objectives (商业目标)
  - Non-Objectives (非商业目标)
  - Requirements / User Scenarios (需求/用户故事)
  - Assumptions (假设条件)
- Examples
  - [WIP] PRD- Device Graph
  - Live DAI - Master PRD
  - Hulu Ad Exchange\_ Reporting Spec

# User Story

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- User stories articulate the experience of what the user will be able to do once this feature exists. (用户故事阐明了用户在此功能存在后将能够获得什么样的体验)
- User stories are a place to start a conversation, they are not standalone documentation. (用户故事标志着事件的开启，它们不是独立的存在)

User stories are short, simple descriptions of a feature told from the perspective of the person who desires the new capability, usually a user or customer of the system. (用户故事是对功能的简短描述，通常是站在系统用户或客户的角度，对一个功能进行简短的、简单的描述)

Put another way, a user story is an outcome, who it's for, and why they care about it. (换句话说，用户故事是一个结果，它的目的是什么，以及他们为什么关心它。)

User Stories typically follow a simple template: (用户故事通常遵循一个简单的模板：)

As a < type of user >, I can < some goal > so that < a thing the user cares about is true >. (作为<用户类型>，我可以设置<一些目标>，以便满足<用户真正关心的事情>。)

- User Clause - As a <type of user>; this is who the outcome is for (用户条款-作为<用户类型>; 这是谁想要的结果)
- Outcome Clause - I can <outcome that is possible once the work is done>; a concise statement of that outcome (结果条款-我可以<完成工作后可能的结果>; 关于结果的简明陈述)
- Value Clause - so that <a thing the user cares about is true>; why the user cares about it (价值条款-使得<用户关心的事情是正确的>; 用户为何关心它)

# User Story

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## Acceptance Criteria (验收标准)

Be outcome oriented, think about the final experience and value for the user that this story will deliver. (以结果为导向, 思考这个故事将为用户提供的最终体验和价值)

- Example: Monsters University course registration platform rejects the course retaking requests because of the randomize selection strategy. (Monsters大学课程注册平台由于采用随机选择策略而拒绝重新获取课程请求)
  - As a student who needs to retake a course (作为一个需要重修课程的学生)
  - I want my retaking requests to be always approved by the course registration platform (我希望我的重考请求被课程注册平台批准)
  - So that my graduation will not be blocked by missing retaking courses (这样我的毕业成绩就不会因为错过重修课程而受到影响)

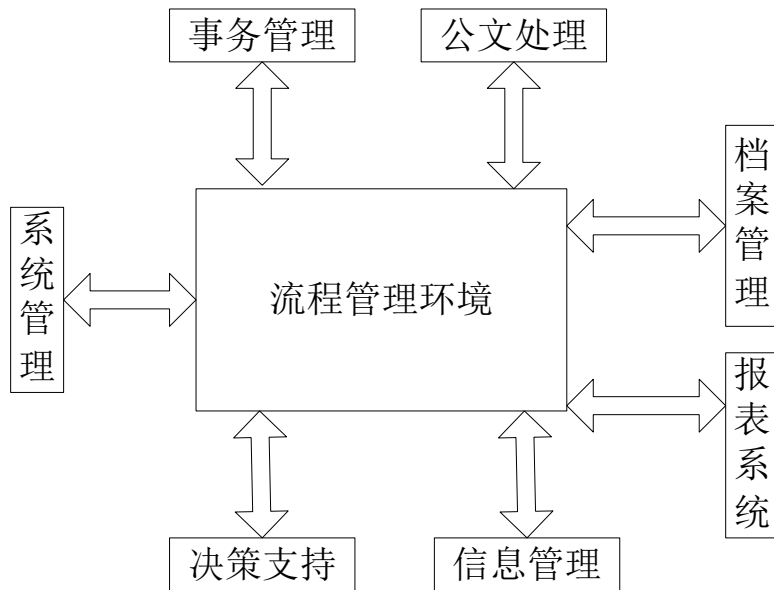
# Transaction flow diagram

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- 业务流程图是从业务入手，从与企业生产经营直接有关的机构开始，进行业务调查而形成。业务流程图(transaction flow diagram, TFD),就是用一些规定的符号及连线来表示某个具体业务处理过程。
- 业务流程图是一种描述系统内各单位、人员之间业务关系、作业顺序和管理信息流向的图表，利用它可以帮助分析人员找出业务流程中的不合理流向。
- 所有的业务流程都有一个共同的特征：工作流程，因此，可以建立一个工作流平台，使所有的业务流程只要在工作流平台中进行定义就可以运作，从而实现“零代码编写的理想目标”

# Workflow

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# Student Information System

(学生信息系统)

# During the Business Analysis, You will

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- Request some documents like
  - Rules of course application and seats assignment (课程申请规则与座位分配)
  - Rules of grading of different types of courses (不同类型课程的评分规则)
  - Classrooms information (教室信息)
  - Course information (课程信息)
  - .....
- Site visits
- Questionnaires
  - User process
  - Experience
  - Suggestions

# During the Business Analysis, You will

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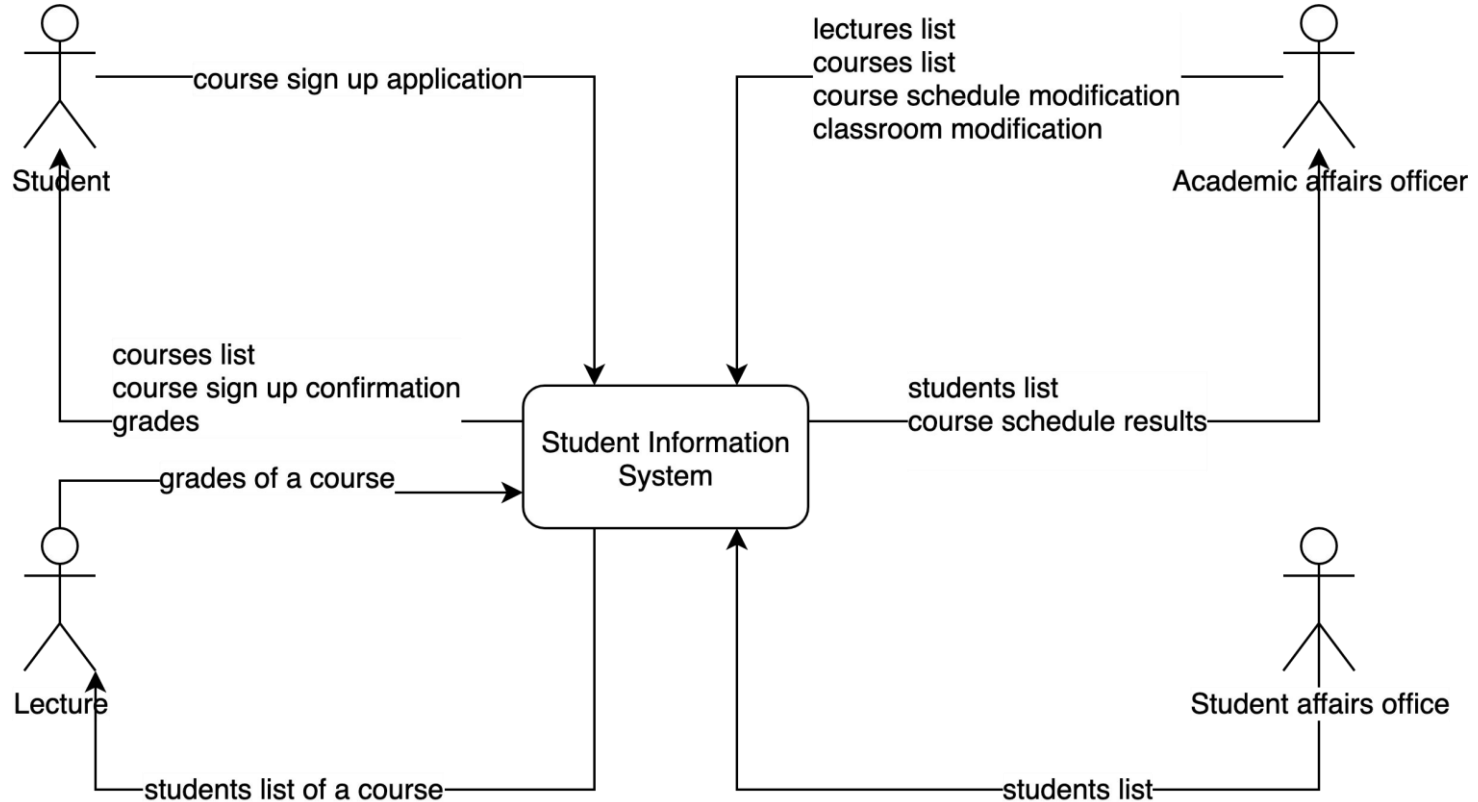
- Interview
  - Investigate the organization chart, select your interviewee and schedule the time（根据组织结构图，选择你的受访者并安排时间）
  - Prepare your interview
    - Agenda
    - Question list
    - Keep impartial
  - Interview
    - Communication skills
  - Post-interview
    - Share the summary

# During the Business Analysis, You will

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- Organize joint requirements planning (JRP) (组织联合需求策划)
  - Attendees
    - Owner, host, users, recorder, tech (业主, 主人, 用户, 记录员, 技术人员)
  - Plan a JRP
    - Location (位置)
    - Attendees (参与者)
    - Agenda (议程)
  - Pros
    - Involve users (managers) to the project proactively (让用户 (经理) 积极参与项目)
    - A joint meeting instead of scattered interviews (召开联合会议, 而不是分散进行面试)
    - Prototype discussion in the meeting (在会议中进行原型讨论)

# Context Diagram



# Business Analysis Output

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- User stories
  - As a student / lecture, ...
- Data / Entity spec（数据规范）
  - Key properties of Course, Classroom...
- Detail Requirements（详细描述）
  - Logic of core function
    - Process of course registration
  - Reporting example
    - Grading report example of a course

# Feasibility Analysis / Study

(可行性研究)

# Feasibility Analysis / Study

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- **Feasibility** - the measure of how beneficial or practical an IS will be to an organization
- **Feasibility Analysis** - the process by which feasibility is measured
- The goal is to determine whether the project should go ahead, be redesigned, or else abandoned altogether.  
(目的是确定该项目是否应该继续进行，或者重新设计还是放弃)

可行性研究主要任务是“了解客户的要求及现实环境，从技术、经济和社会因素等三方面研究并论证本软件项目的可行性，编写可行性研究报告，制定初步项目开发计划。”



# A Creeping Commitment Approach

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- When to run feasibility analysis?
  - Feasibility should be measured throughout the life cycle
  - Checkpoints
    - By the end of scope definition
    - By the end of problem analysis
    - By the end of decision analysis

- Why to run many times of feasibility analysis?

- (1)复查确认系统目标、规模
- (2)研究正使用系统工作流程
- (3)导出新系统高层逻辑模型
- (4)重新定义问题
- (5)导出和评价供选择的方案
- (6)推荐可行的方案
- (7)草拟开发计划
- (8)编写可行性研究报告，送审

可行性研究的步骤

# Feasibility Analysis Includes

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- Operational Feasibility (可行性操作)
- Cultural (Political) Feasibility (文化/政治可行性)
- Technical Feasibility (技术可行性)
- Schedule Feasibility (计划可行性)
- Economic Feasibility (经济可行性)
- Legal Feasibility (法律可行性)

抉择

# Operational Feasibility

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- How well proposed system solves the problems and takes advantage of opportunities identified during the scope definition and problem analysis phases (系统如何更好地解决已知问题并在范围定义和问题分析阶段发现的机会)
- How well proposed system satisfies system requirements identified in the requirements analysis phase (系统如何满足需求分析阶段中确定的系统需求)
- Is the problem still worth solving? (这个问题还值得被解决吗? )

# Cultural (Political) Feasibility

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- Does management support the system? (管理层是否支持该系统? )
- How do end users feel about their role in the system? (用户对他们在系统中的角色有何感想? )
- What end users may resist or not use the system? How can this be overcome? (哪些用户可能抵制或不使用该系统? 如何克服这一点? )
- How will the working environment change? Can users and management adapt to the change? (工作环境将如何变化? 用户和管理层能否能适应变化? )

社会环境的可行性至少包括两种因素：市场与政策。

市场又分为未成熟的市场、成熟的市场和将要消亡的市场。

涉足未成熟的市场要冒很大的风险，要尽可能准确地估计潜在的市场有多大？自己能占多少份额？多长时间能实现？

挤进成熟的市场，虽然风险不高，但油水也不多。如果供大于求，即软件开发公司多，项目少，那么在竞标时可能会出现恶性杀价的情形。国内第一批卖计算机的、做系统集成的公司发了财，别人眼红了也挤进来，这个行业的平均利润也就下降了。

将要消亡的市场就别进去了。政策对软件公司的生存与发展影响非常大。整个90年代，中国电信的收费相当高，仅此一招就把国内互联网企业打得奄奄一息。某些软件行业的利润很高，但可能存在地方保护政策，使竞争不公平。政策不当将阻碍软件公司的健康发展，可最怕的还是政府干预企业的正当行为。

# Technical Feasibility

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- Is the proposed technology or solution practical? (所提出的技术问题或解决方案是否实用? )
- Do we currently possess the necessary technology? (我们目前是否拥有必要的技术? )
- Do we possess the necessary technical expertise? (我们是否拥有必要的技术专长? )

度量一个特定技术信息系统解决方案的实用性及技术资源的可用性

技术可行性分析至少要考虑以下几方面因素：

(1) 在给定的时间内能否实现需求说明中的功能。如果在项目开发过程中遇到难以克服的技术问题，麻烦就大了。轻则拖延进度，重则断送项目。

(2) 软件的质量如何？有些应用对实时性要求很高，如果软件运行慢如蜗牛，即便功能具备也毫无实用价值。有些高风险的应用对软件的正确性与精确性要求极高，如果软件出了差错而造成客户利益损失，那么软件开发方可要赔惨了。

(3) 软件的生产率如何？如果生产率低下，能赚到的钱就少，并且会逐渐丧失竞争力。在统计软件总的开发时间时，不能漏掉用于维护的时间。软件维护是非常拖后腿的事，它能把前期拿到的利润慢慢地消耗光。如果软件的质量不好，将会导致维护的代价很高，企图通过偷工减料而提高生产率，是得不偿失的事。

技术可行性分析可以表述为：**做得了吗？做得好吗？做得快吗？**

# Schedule Feasibility

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- Are specified deadlines mandatory or desirable? (指定的截止日期是强制性的还是可变更的? )
- Are mandatory deadlines realistic for proposed solution? (在截止日期前是否可以解决该系统问题? )

# Economic Feasibility

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- During Scope Definition （范围确定期间）
  - Do the problems or opportunities warrant the cost of a detailed study and analysis of the current system? （这些问题或机遇是否值得对现行制度进行详细研究和分析？）
- During Problem Analysis （问题分析期间）
  - After a detailed study of the current system （经过对现行制度的详细研究）
  - Better estimates of development costs and benefits （更好地估计开发成本和收益）
- During Decision Analysis （决策分析期间）
  - Requirements now defined （定义当前需求范围）
  - Development costs can be better estimated （更好的评估开发成本）

度量系统解决方案的性能价格比

考虑的问题

成本/效益分析 有形成本、效益、无形成本、效益

价值和成本的关系 质量与价值、成本的关系 价值/成本的均衡

# Economic Feasibility

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- 经济可行性分析主要包括：“成本-收益”分析和“短期-长远利益”分析。
- **成本-收益分析**
- 成本-收益分析最容易理解，如果成本高于收益则表明亏损了，如果成本大大高于收益那就亏大了。
- 如果是为客户做软件项目，那么收益就写在合同中。如果是做自己的软件产品，那么收益就是销售额。
- 人们在预估产品销售额时常常过分乐观而犯下大错。那些对你的产品说恭维话的人并不见得就是要买货的人，俗话说“嫌货才是买货人”。当你没碰到一个挑刺的人而感觉这产品好得会让你发大财时，就要做好会破产的心理准备。
- **短期——长远利益分析**
- 人们喜欢吃着碗里的、看着锅里的，还想着别人家里的。短期利益和长远利益兼得是人们梦寐以求的事。在商业上，这等好事可不会轻易降临。
- 短期利益容易把握，风险较低。长远利益难以把握，风险较大。



# Legal Feasibility

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- Copyrights (版权)
- Union contracts (合同)
- Legal requirements for financial reporting (财务报告的法律要求)
- Antitrust laws (反垄断法)
- National data and work laws (国家数据和工作法)

# Economic Feasibility

# Cost

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- Development costs (开发费用)
  - Personnel
  - Computer usage
  - Training
  - Supply, duplication and equipment
  - Computer equipment and software
- Operating costs (运营成本)
  - Fixed costs
  - Variable costs

# Benefits

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- Tangible benefits (可见收益)
  - Fewer processing errors (减少过程中的错误)
  - Increased throughput (提高吞吐量)
  - Decreased response time (缩短响应时间)
  - Elimination of job steps (排除中间步骤)
  - Increased sales (增加销售额)
  - Reduced credit losses (减少信贷损失)
  - Reduces expenses (减少开支)
- Intangible benefits (无形收益)

# Cost-effectiveness Techniques

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- Payback Analysis (投资回报分析)
  - A technique for determine if and when an investment will pay for itself (判断一项投资是否值得以及何时能收回成本的技术)
  - Payback period: the period of time that will lapse before accrued benefits overtake accrued and continuing costs (投资回收期: 投资项目投产后获得的收益总额达到该投资项目投入的投资总额所需要的时间)
- Return On Investment (ROI) (投资回报率)
  - A technique that compares the lifetime profitability of alternative solutions (衡量企业的终生盈利状况的一种比率)
- Net Present Value (净现值)
  - Analysis techniques that compares annual discounted costs and benefits of alternative solutions (一种对比解决方案的年度折价成本和收益情况的分析方法)

# Time Value of Money (货币的时间价值)

- Used by all three cost-effectiveness techniques  
(三种成本效益技术的应用)

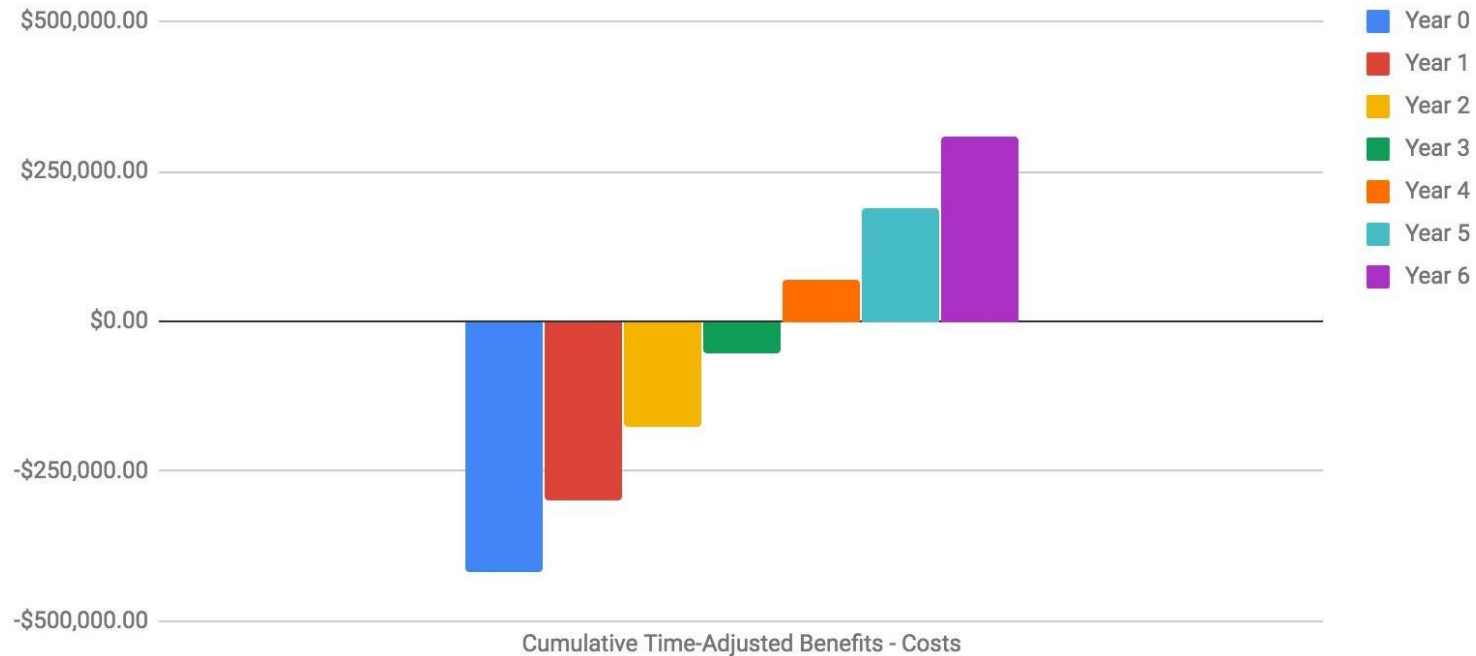
ROI = 10%							
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Present Value	\$100.00	\$110.00	\$121.00	\$133.10	\$146.41	\$161.05	\$177.16
Present Value	\$11,289.48	\$12,418.43	\$13,660.27	\$15,026.30	\$16,528.93	\$18,181.82	\$20,000.00
Present Value	\$16,528.93	\$18,181.82	\$20,000.00				

# Payback Analysis (投资回报分析)

Discount Rate = 12%									
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6		
Development Cost	\$418,040.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
Operation & Maintenance Cost	\$0.00	\$15,045.00	\$16,000.00	\$17,000.00	\$18,000.00	\$19,000.00	\$20,000.00		
Discount Factor	1.000	0.893	0.797	0.712	0.636	0.567	0.507		
Time-Adjusted Costs (Present Value)	\$418,040.00	\$13,433.04	\$12,755.10	\$12,100.26	\$11,439.33	\$10,781.11	\$10,132.62		
Cumulative Time-Adjusted Costs	\$418,040.00	\$431,473.04	\$444,228.14	\$456,328.40	\$467,767.73	\$478,548.84	\$488,681.46	Lifetime Costs	
Benefits	\$0.00	\$150,000.00	\$170,000.00	\$190,000.00	\$210,000.00	\$230,000.00	\$250,000.00		
Discount Factor	1.000	0.893	0.797	0.712	0.636	0.567	0.507		
Time-Adjusted Benefits	\$0.00	\$133,928.57	\$135,522.96	\$135,238.25	\$133,458.80	\$130,508.18	\$126,657.78		
Cumulative Time-Adjusted Benefits	\$0.00	\$133,928.57	\$269,451.53	\$404,689.78	\$538,148.57	\$668,656.75	\$795,314.53	Lifetime Benefits	
Cumulative Time-Adjusted Benefits - Costs	-\$418,040.00	-\$297,544.46	-\$174,776.61	-\$51,638.62	\$70,380.85	\$190,107.91	\$306,633.07	Net Present Value of this Alternative	

# Payback Analysis

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# ROI

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- Lifetime ROI
  - = (Net Present Value) / Lifetime Costs \* 100%
  - = (Lifetime Benefits - Lifetime Costs) / Lifetime Costs \* 100%
- Annual ROI
  - = (Lifetime ROI) / Lifetime
- Minimum Acceptable ROI

# Candidate Solutions

(备选解决方案)

# Candidate Systems Matrix (备选系统矩阵)

Feature	Option 1	Option 2	Option 3
Portion of System Computerized	Student information system from abcdef.com	User management; Course application and scheduler; Transcript management	Same with option 2
Benefits	This solution can be implementated quickly because it's a purchased solution	Fully supports user required business processes	Same with option 2
Servers	Aliyun	Same with option 1	Same with option 1
Software Tools Needed	Browser	VS 2012 SQL Server 2012 Browser	Ubuntu 16.04 Apache 2.4 MySQL 5.6 PHP 7.x Browser
Application Software	Package solution	Custom solution	Same with option 2
Data Storage	Aliyun	Same with option 1	Same with option 1
.....			

# Feasibility Analysis Matrix (可行性分析矩阵)

	Weight		Option 1	Option 2	Option 3
Description			Commercial package from abcdef.com	Upgrade the existing system (.net)	Development a new system (lamp)
Operational Feasibility	15%	Points	60	100	100
		Desc	Need to change current business process to adapt to the solution	Support all functional requirements	Support all functional requirements
Cultural (Political) Feasibility	15%	Points	100	100	100
		Desc	No critical issue	No critical issue	No critical issue
Technical Feasibility	20%	Points	80	60	100
		Desc	No need for further development for now; May need custom development for future	Engineer need to learn the existing tech stack; .net is not as popular as 5 years ago	Engineers are familiar the LAMP tech stack; It's easy to hire LAMP engineers from the market in the future
Schedule Feasibility	30%	Points	95	85	80
		Desc	<3 months	~6 months	9~12 months
Economic Feasibility	10%	Points	60	90	85
		Desc	Development cost: \$350000 Payback: 4.5 years Net present value: \$210000	Development cost: \$400000 Payback: 3.3 years Net present value: \$325000	Development cost: \$418000 Payback: 3.5 years Net present value: \$307000
Legal Feasibility	10%	Points	100	100	100
		Desc	No critical issue	No critical issue	No critical issue
Total Points			84.5	86.5	92.5



谢谢!

