

CHAPTER 9

Software Project Management

Outline

- Estimating Cost**
- Planning**
- Team organization**
- Configure management**
- Management standards**

Today's Outline

- Team and organization
- Communication
- Configure management
- Management standards
 - ✓ ISO 9000

✓ CMM

Software Management standards

- ISO 9000
- CMM

ISO 9000



**Now that you're
ISO 9000 Certified,
we can do business
with you.**

ISO 9000质量标准

- 质量保证体系：用于实现质量管理的组织结构、责任、规程、过程和资源。
- 创建质量保证体系的目的是帮助组织以符合规格说明的方式，保证组织的产品和服务满足客户的期望。
- ISO 9000是一个用于在所有行业建立质量管理体系的国际标准集。其中ISO 9001在这些标准中最具普遍性的标准，它适用于设计、开发和产品维护等机构内的质量过程。它制定出一般的质量原则、描述一般的质量过程，并编排应该定义的组织标准和步骤。

ISO 9000

- ISO is the International Organization for Standardization.
 - ✓ It is located in Switzerland and was established in 1947 to develop common international standards in many areas
- The term ISO 9000 refers to a set of quality management standards.
- ISO's purpose is to facilitate international trade by providing a single set of standards that people everywhere would recognize and respect.
- You generally become ISO 9000 certified because your customers expect you to do so or because a governmental body has made it mandatory.

ISO 9001的核心过程

ISO 9001标准在2000年进行了一次重大的修改，形成了9个核心过程：

产品交互过程

- ✓ 业务获取
- ✓ 设计和开发
- ✓ 测试
- ✓ 生产和交付
- ✓ 服务和支持

支持过程

- ✓ 业务管理
- ✓ 供应商管理
- ✓ 库存管理
- ✓ 配置管理

为了服从ISO9001标准，
公司必须记录他们的过程
如何与这9个过程相对应

为什么 ISO 9000对任何公司都适用

- 自己制定相关质量管理体系标准
- 自行制定程序文件 Program file

举例：某软件公司
ISO 9000体系

ISO 9000 认证

- You can develop a Quality Management System that meets the requirements specified by ISO 9001:2000

Examples of Major Categories:

- ✓ Establish your quality system
- ✓ Document your quality system
- ✓ Support quality
- ✓ Satisfy your customers
- ✓ Establish a quality policy
- ✓ Carry out quality planning
- ✓ Control your quality system
- ✓ Perform management reviews
- ✓ Provide quality resources
- ✓ Provide quality infrastructure
- ✓ Monitor and measure quality

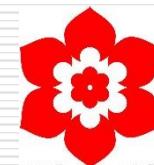
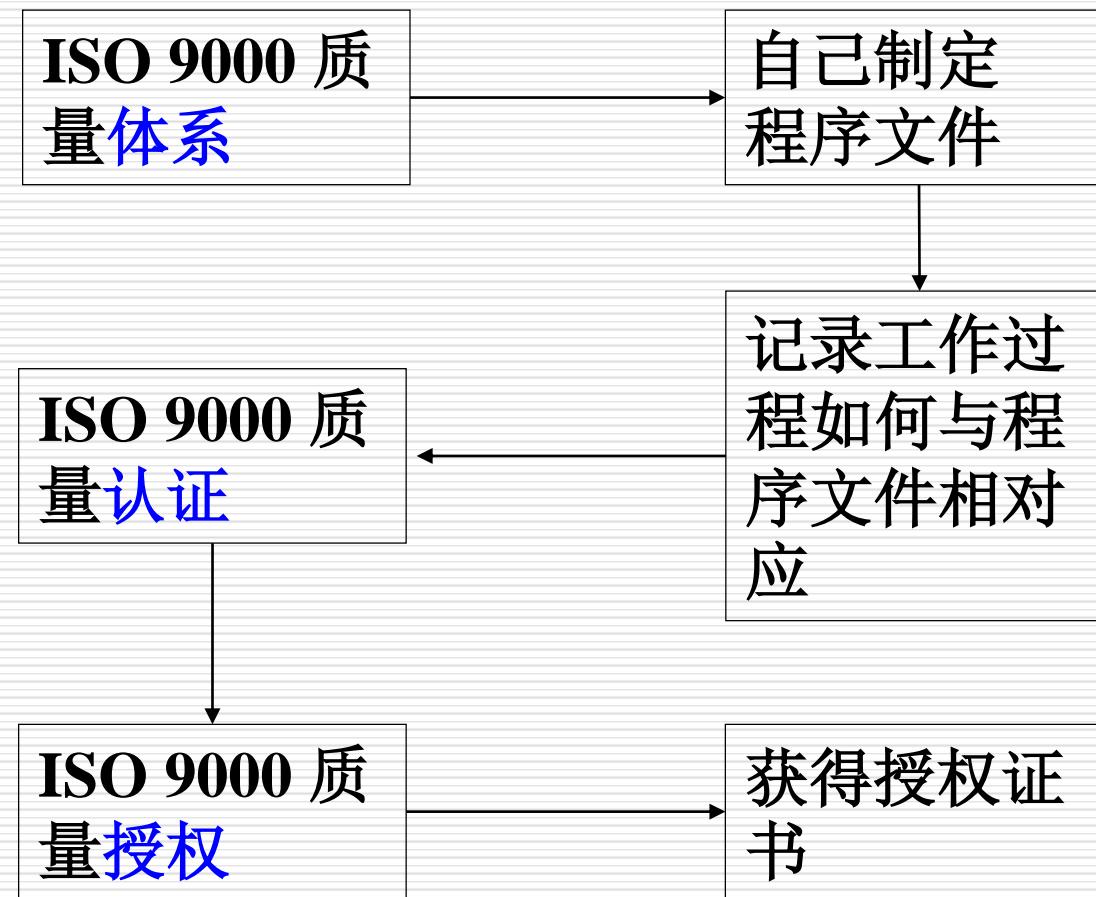
Becoming Certified

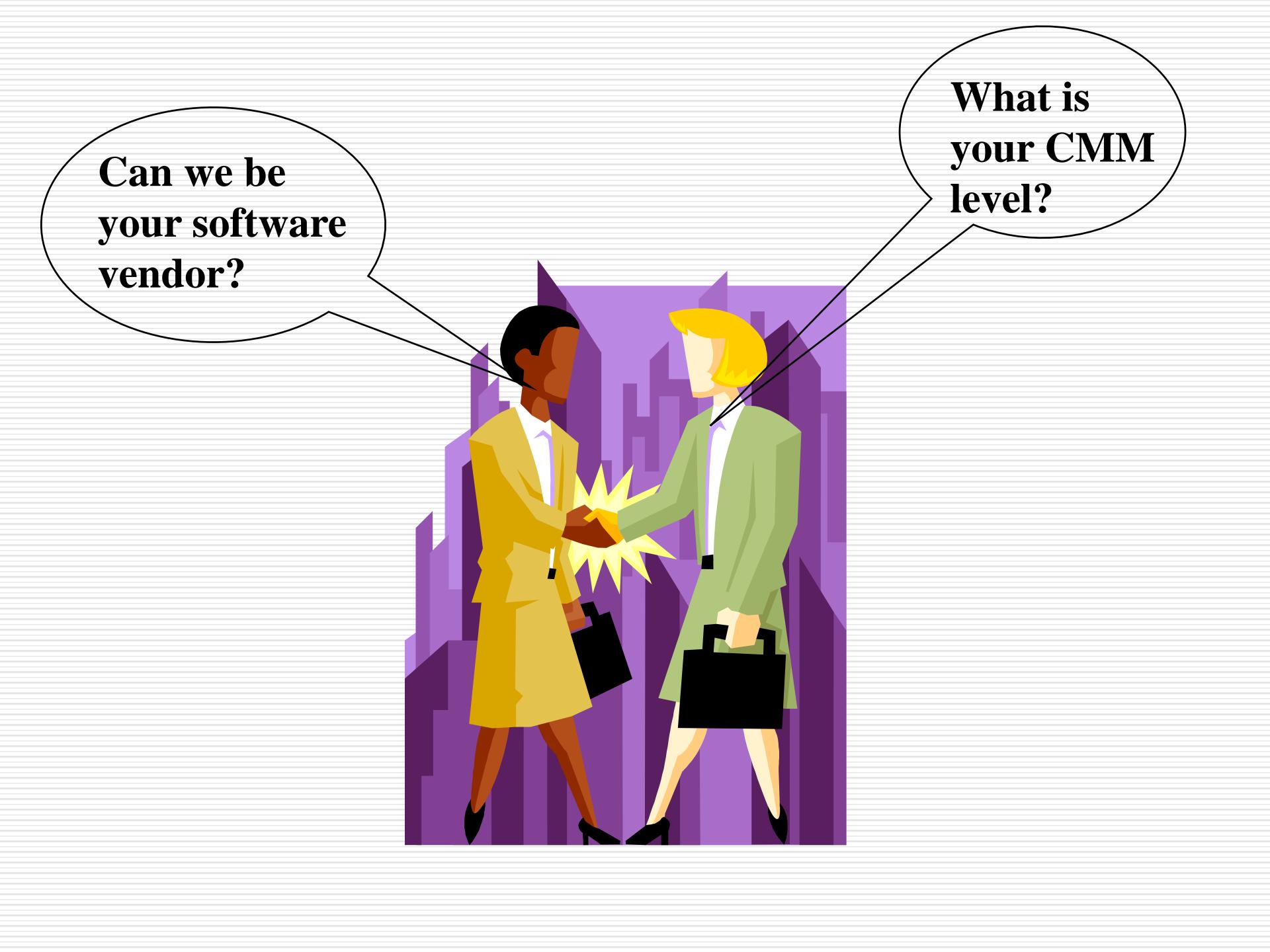
- With ISO, they don't try to tell you how to do anything. If you document, follow it, and produce quality products, that's OK.**
- A Registrar come to your site to audit the effectiveness of your Quality Management System.**
- Actually, an official auditor does not have to certify you, you can do it yourself. Customers will more likely believe an independent external auditor.**

ISO 9000 认证流程

国际标准组织

公司、行业



An illustration of two business people, a man and a woman, shaking hands in front of a purple bar chart. The man is wearing a yellow suit and the woman is wearing a green suit. They are both holding black briefcases. A speech bubble on the left says "Can we be your software vendor?" and a speech bubble on the right says "What is your CMM level?"

**Can we be
your software
vendor?**

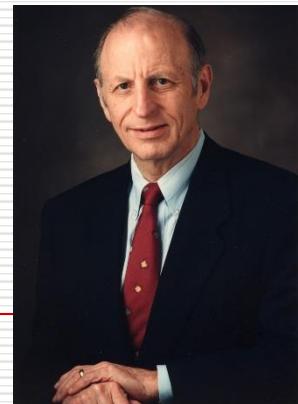
**What is
your CMM
level?**

CMM

名称: **Capability Maturity Model for Software**

目的: Improving the Software Development **Process**

软件质量与过程



Watts Humphrey (CMM项目的主要负责人) 指出：

- 软件系统的质量取决于用来开发和改进它的过程的质量。
--说明了产品和过程的关系。
- 如果你迷路了，那么即使你有一张地图也是没有用的。
--说明要进行过程改进，必须对现有的过程有所了解，特别是存在的问题有客观的认识
- 软件过程改进并不是目的地，它只是一个旅程。
--说明过程改进是一个持续的过程

Capability Maturity Model

1) CMM是什么

- CMM是用于衡量软件过程能力的事实上的标准，同时也是目前软件过程改进最好的参考标准。
- 美国卡内基-梅隆大学软件工程研究所（SEI）研制

2) 发展简史

- CMM 1.0于1991年制定。
- CMM 1.1于1993发布，该版本应用最广泛。
- CMM 2.0草案于1997年制定（未广泛应用）。
- 到2000年，CMM演化成为CMMI（Capability Maturity Model Integration），CMM 2.0成为CMMI 1.0的主要组成部分。

3) CMM重要概念

- 5个成熟度等级：Initial, Repeatable, Defined, Managed, Optimizing
- 18个关键过程域。指出为了达到某个成熟度等级必须要解决的一族问题

Capability Maturity Model

4) 能力成熟度模型的基本思想

- 帮助软件开发机构建立一个有规律的、成熟的软件过程。改进后的软件过程将开发出质量更好的软件，使更多的软件项目免受时间和费用超支之苦。

5) CMM的策略

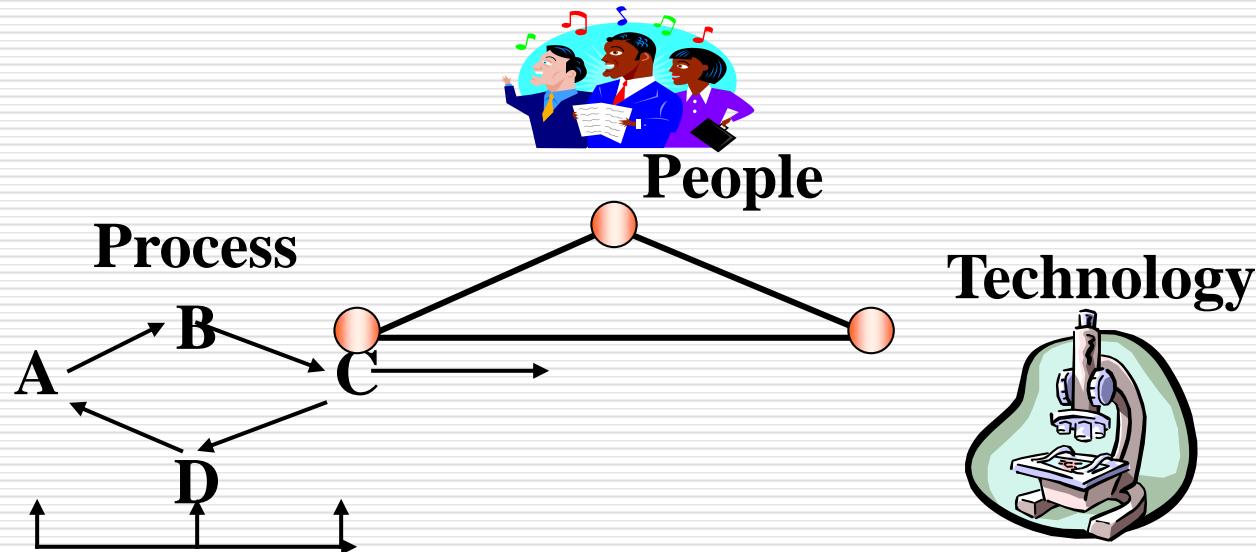
- 力图改进对软件过程的管理，而在技术方面的改进是其必然的结果。

6) CMM在改进软件过程中所起的作用

- 指导软件机构通过确定当前的过程成熟度并识别出对过程改进起关键作用的问题，从而明确过程改进的方向和策略。通过集中开展与过程改进的方向和策略相一致的一组过程改进活动，软件机构便能稳步而有效地改进其软件过程，使其软件过程能力得到循序渐进的提高。

CMM的基本内容

支撑软件产品 / 系统质量的三大要素：



“整个软件任务可以看作是一个过程，该过程可以予以控制、测量和改进”

-----Watts S. Humphrey

基本概念

(1) 过程

过程 (Process) 是一种手段，通过该手段可以把人、规程、方法、设备以及工具进行集成，以产生一种所期望的结果。

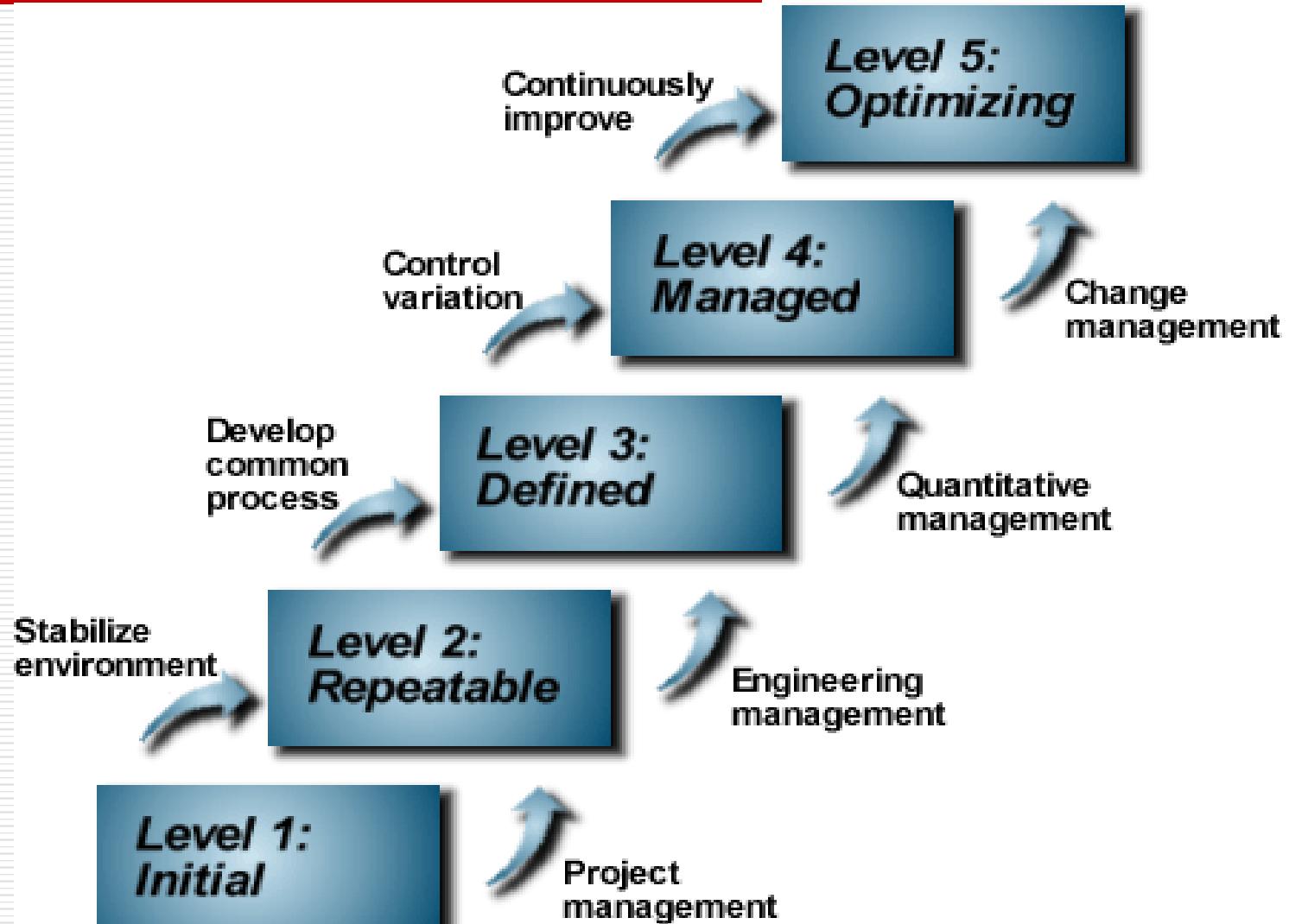
(2) 过程能力

(开发组织或项目组) 通过遵循其软件过程能够实现预期结果的程度。

(3) 过程成熟度 (Process Mature)

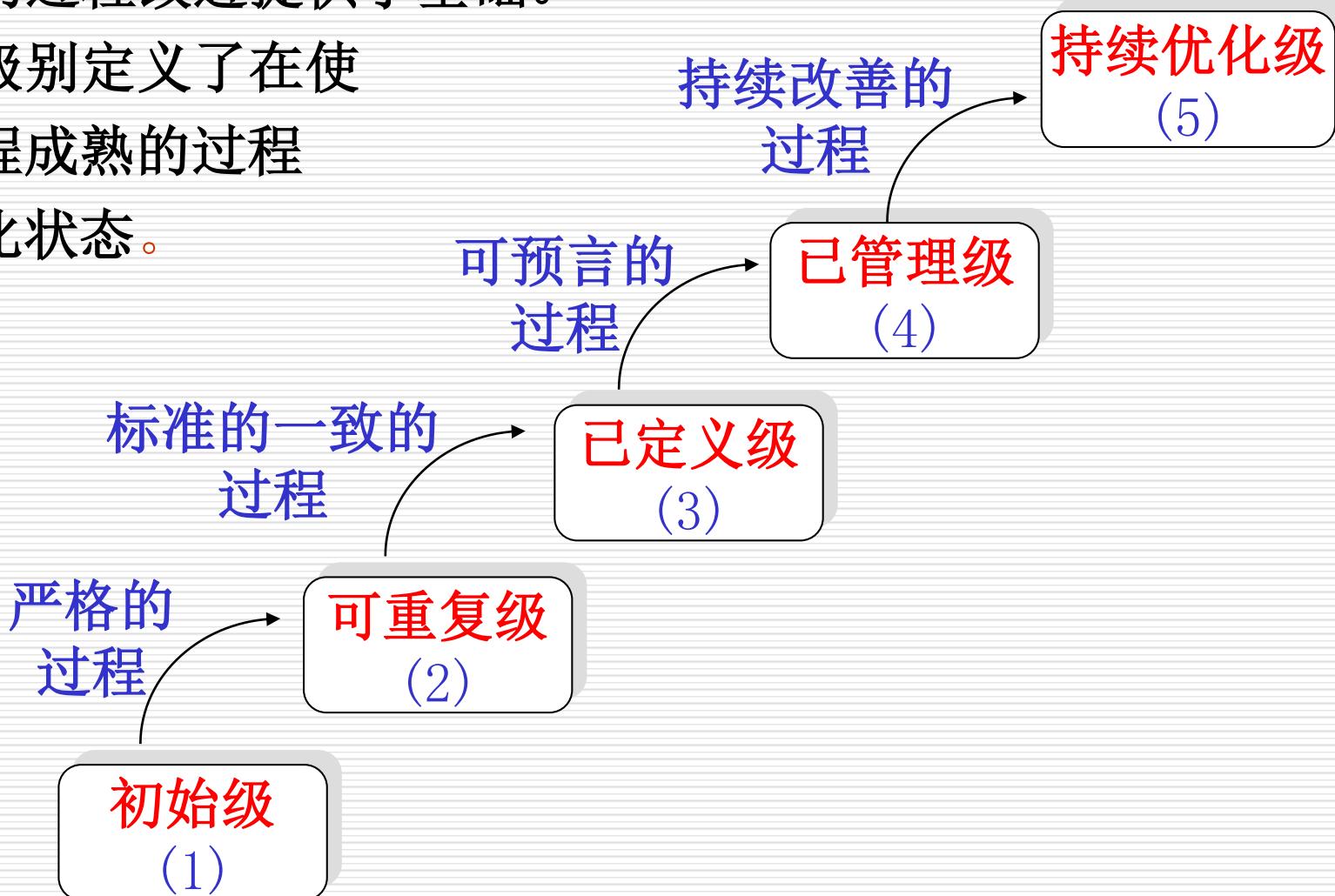
一个特定软件过程被明确和有效地定义、管理、测量和控制的程度。

Maturity Levels



CMM 五个级别

- CMM提供了将这些演化步骤组织为5个成熟度级别的框架，这为持续的过程改进提供了基础。
- 成熟度级别定义了在使软件过程成熟的过程中的演化状态。



CMM 五个级别

➤ 初始级

- 组织：组织通常没有提供开发和维护软件的稳定的环境。
- 项目：当发生危机时，项目通常放弃计划的过程，回复到编码和测试。
- 过程能力：不可预测。**(unpredictable)**

➤ 可重复级

- 组织：将软件项目的有效管理过程制度化，这使得组织能够重复以前项目中的成功实践。
- 项目：配备了基本的软件管理控制。
- 过程能力：严格的。**(disciplined)**

Level 1 Initial

Focus: Good Personnel

➤ No stable environment

- ✓ In a crisis- planned procedures abandoned
- ✓ Revert to coding fixes
- ✓ Unpredictable outcomes, little formalization
- ✓ Same requirements could get different software.
- ✓ Good personnel, but not good organization
- ✓ Only a good manager or team gets the project completed successfully, but when they leave, the stability of the project leaves with them
- ✓ Risky and wasteful

Level 2 Repeatable

Focus: Project Management

- Same requirements give same software**
- Policies for managing projects are created**
- Procedures for implementation of policies are established**
 - ✓ **Based on similar previous projects**
 - ✓ **Software standards defined**
 - ✓ **Configuration Management implemented**
- Disciplined and stable process**

Notes for Level 2

- Planned and tracked**
- Standards and methods for constructing a project plan**
 - Using same tools, Naming conventions**
- Know what people do**
- BUT is not transferable to another team, department**
- 2000 CSC of India (one of largest IT service corporations in world achieved 4 only 150 companies in the world at that time.**
- Usually takes about 2 years to achieve**

CMM 五个级别

➤ 已定义级

- 组织：在组织范围内开发和维护软件的标准过程被文档化，其中包括软件工程过程和管理过程，它们集成成为一个一致的整体。
- 项目：对组织的标准软件过程进行裁剪，来开发它们自己的定义软件过程。
- 过程能力：标准的和一致的。

➤ 已管理级

- 组织：为软件产品和过程都设定了量化的质量目标。
- 项目：项目减小过程性能的变化性，使其进入可接收的量化边界，从而达到对产品和过程的控制。
- 过程能力：可预言的。**(predictable)**

Level 3 – Defined

Focus:Organizational Support

- Processes and procedures are **documented**
- Well defined, coherent, integrated software engineering and management processes
- Readiness criteria, standards, verification mechanisms, completion criteria
- Software engineering and Management activities are stable and repeatable
 - ✓ Training Programs supported
 - ✓ Peer Reviews

NOTES Level 3

- Organization does the same thing
- Methods, documentation transferable
- Most difficult level to achieve, because of the documentation, provides the greatest cost savings
- Usually takes about 4.5 years to achieve

Level 4 – Managed

Focus: Product/Process Quality

- Quantitative quality goals**
- Productivity and quality are measured and analyzed**
- Predictable results because the process is measured and operates within measurable limits**
- Predictable high quality software**

CMM 五个级别

➤ 持续优化级

- 组织：关注于持续的过程改进。
- 项目：软件过程被评价，以防止过失重复发生，从中获得的教训散布给其它项目。
- 过程能力：持续的改善。 (continuously improving)

Level 5 – Optimizing

Focus: Continuous Improvement

- Entire organization is focused on continuous process improvement**
- Organization has means to identify weaknesses and strengths**
- Can proactively prevent occurrence of defects**
- Data on effectiveness of processes used to perform cost benefit analyses of new technologies and propose changes to organization's software process**
- Continuously improving the process**

Notes Level 5

- Constant improvement**
- Whole company is in tuned**
- Programmed understands how his SQL code affects the organization.**
- India has the highest number of Level 5 in world**
- 1/3 are overseas, mostly in India**

Who made the levels

<input type="checkbox"/> 1993	
<input type="checkbox"/> Level 1	85%
<input type="checkbox"/> Level 2	7%
<input type="checkbox"/> Level 3	3%
<input type="checkbox"/> Level 4	Hewllet Packard
<input type="checkbox"/> Level 5	0
<input type="checkbox"/> Level 1	62%
<input type="checkbox"/> Level 2	23%
<input type="checkbox"/> Level 3	13%
<input type="checkbox"/> Level 4	2%
<input type="checkbox"/> Level 5	5 Boeing, IBM, Lockheed Martin, Motorola, Ogden AFB Logistics Center



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