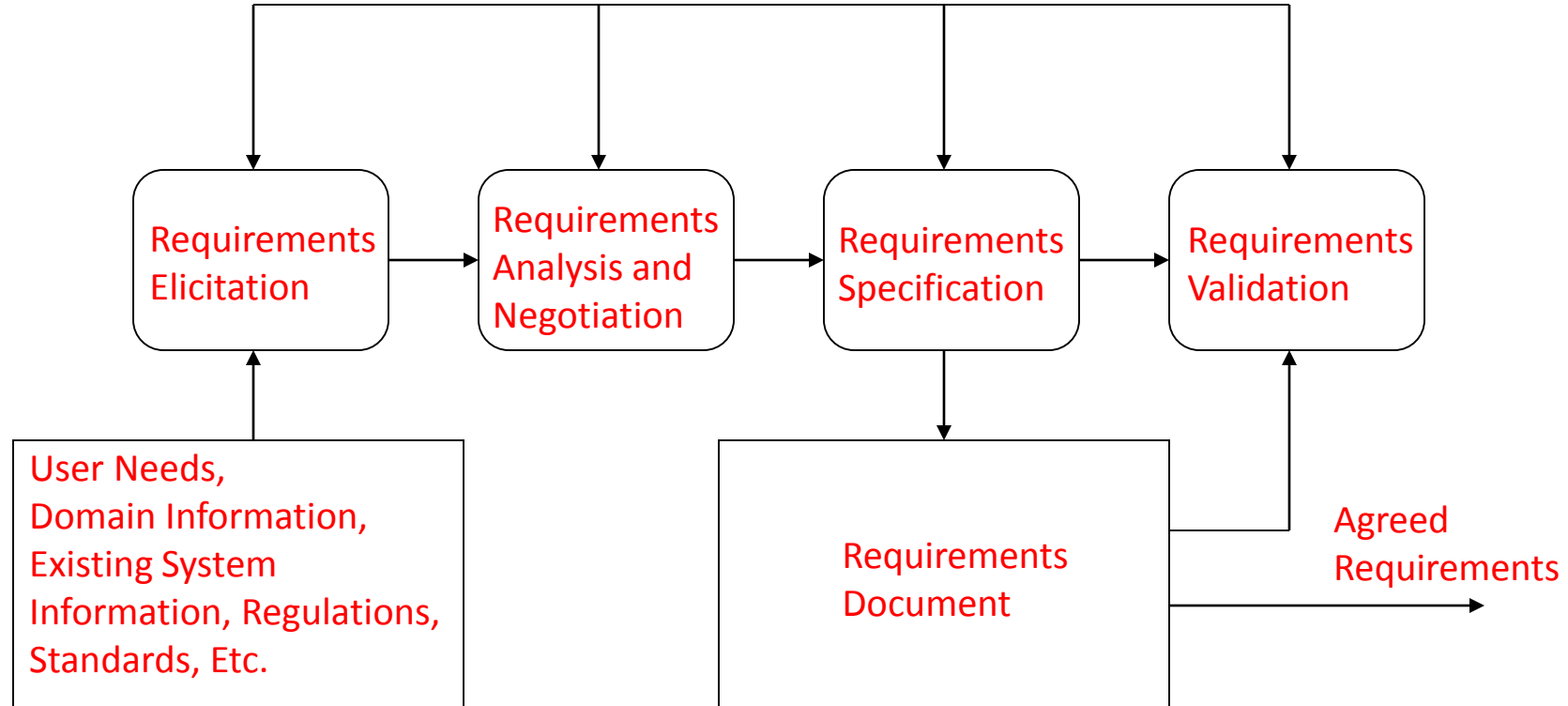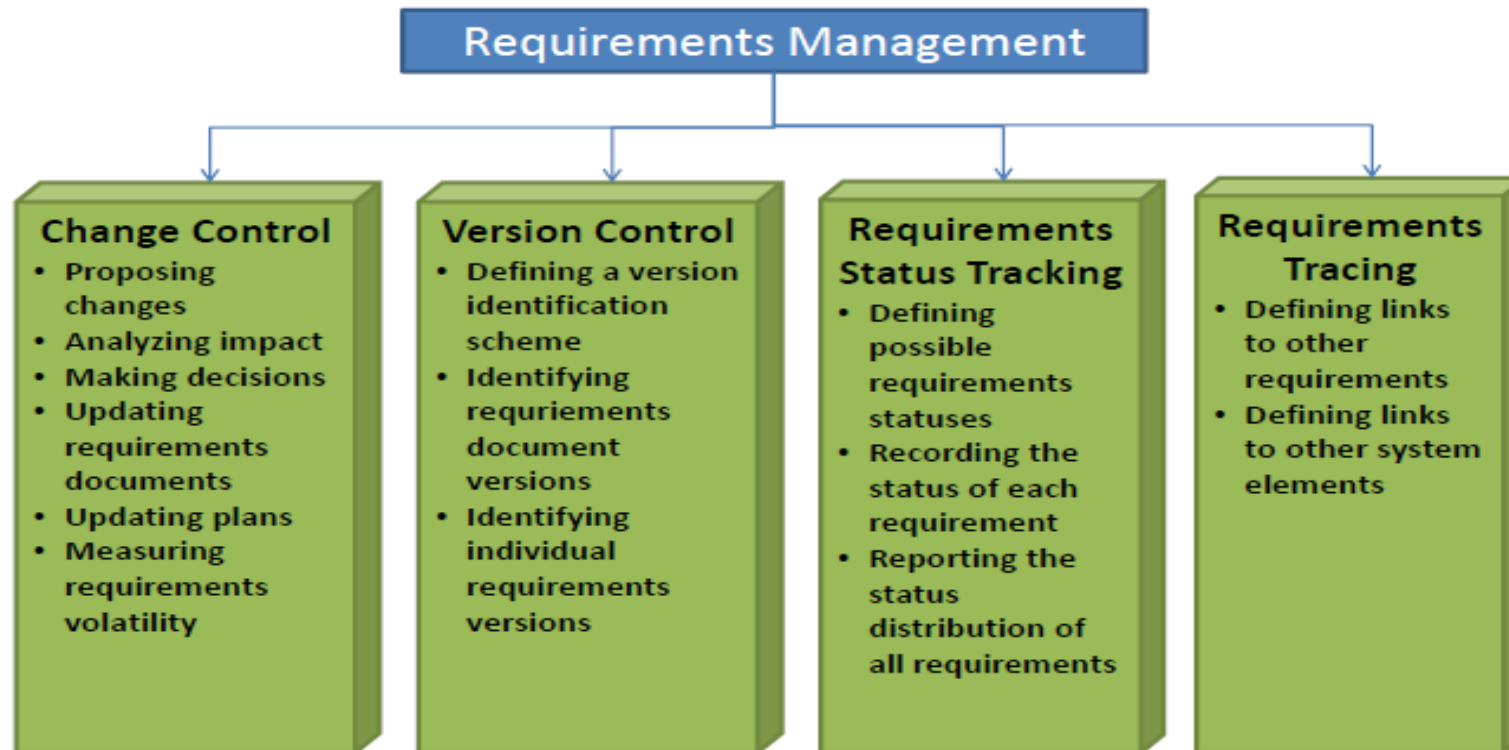# Requirements Management

- The process of managing changes to the requirements for a system
- In this lecture, we'll talk about the reasons for changes in requirements and how to manage them

Requirements Engineering Activities

Requirements Management

- The process of managing changes to the requirements for a system

- Reasons for changes in requirements and how to manage them

Requirements Management

Change Control
- Proposing changes
- Analyzing impact
- Making decisions
- Updating requirements documents
- Updating plans
- Measuring requirements volatility

Version Control
- Defining a version identification scheme
- Identifying requirements document versions
- Identifying individual requirements versions

Requirements Status Tracking
- Defining possible requirements statuses
- Recording the status of each requirement
- Reporting the status distribution of all requirements

Requirements Tracing
- Defining links to other requirements
- Defining links to other system elements

Requirements management

- **Requirements management** is the process of documenting, analyzing, tracing, prioritizing and agreeing on **requirements** and then controlling change and communicating to relevant stakeholders. It is a continuous process throughout a project.

Requirements Management

- Requirements management encompasses the activities involved in
  - requesting changes to the baselined requirements,
  - performing impact analysis for the requested changes,
  - approving or disapproving changes,
  - implementing the approved changes
  - Measure the progress
  - Managing the logical links between individual requirements and other project work products

Requirements Baseline

- Set of functional and non-functional requirements that the development team has committed to implement in a specific release

- Subsequent changes can be made only through the project's defined change-control process

Requirements Management and Traceability

- Requirements cannot be managed effectively without requirements traceability
  - A requirement is traceable if you can discover who suggested the requirement, why the requirement exists, what requirements are related to it and how that requirement relates to other information such as systems designs, implementations and user documentation
  - A requirement is traceable if and only if the origin of each of component requirements is clear
- Traceability is key to impact, derivation and coverage analysis

Change - A Constant

- There is nothing permanent except change
  - Heraclitus (500 B.C.)
- No matter where you are in the system life cycle, the system will change, and the desire to change it will persist throughout the life cycle
- Change always has a price
- Knowledge of knowing more about things motivates us for changes.

Change Control Process
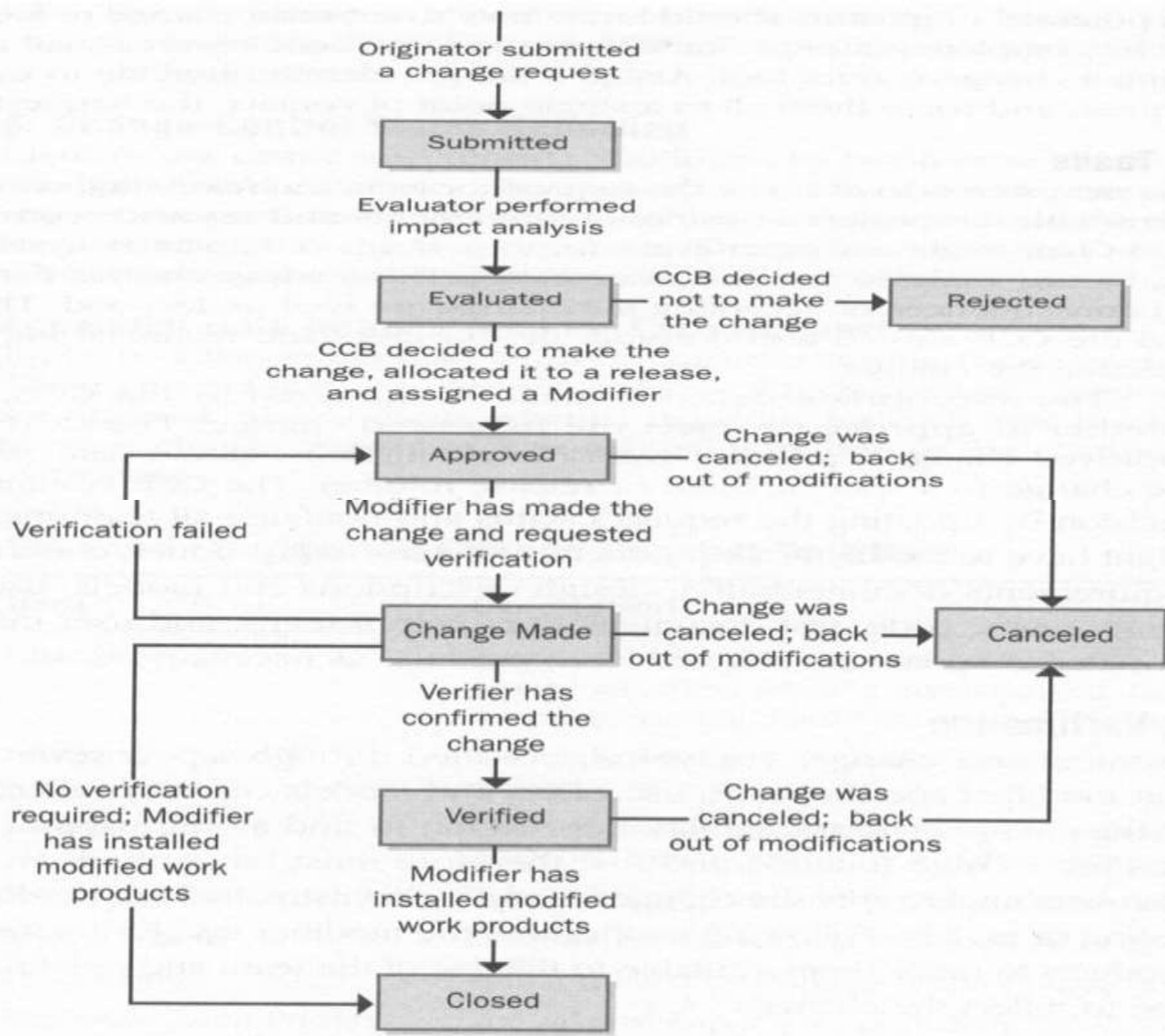
Figure 19-2 State-transition diagram for a change request.

Change Management

- Different types of analysis are used by members of CCB to support change management

- Impact Analysis determine the financial resource or cost of change request to new feature. What if this were to change?

- Derivation analysis answers that "Why is this here"? It focus on discovering the origin or rationale of a function/module

- Coverage analysis is used as measure of progress and answers "Have I covered everything". It is used for management reporting.

Where do changes come from?

Figure 19-4 Sample chart of requirement change origins.
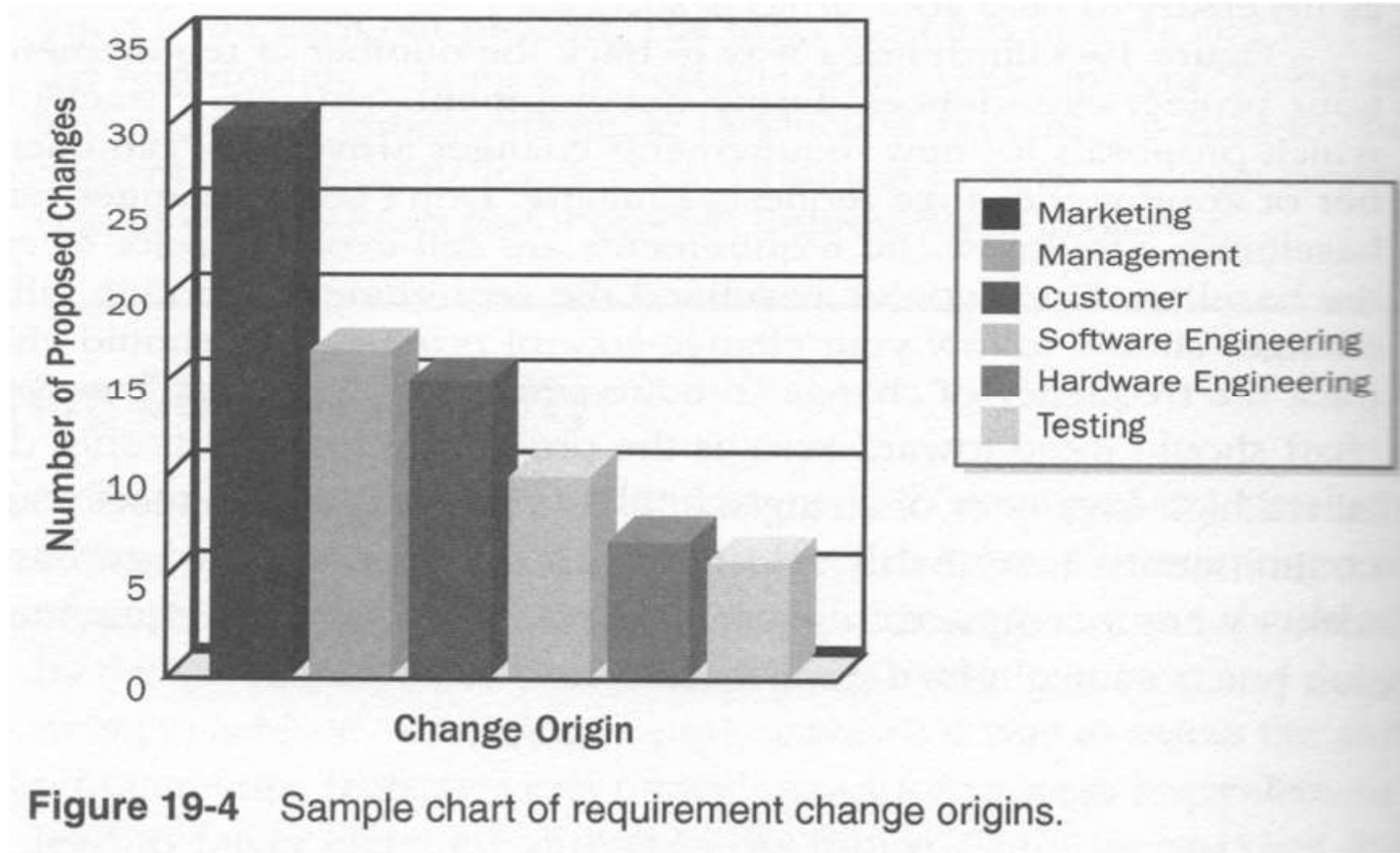
Changing Requirements - 1

- All stakeholders want to change requirements, due to different reasons

- Studies have shown that very significant percentage of delivered defects can be traced back to changing user requirements

Changing Requirements - 2

- A major issue in requirements engineering is the rate at which requirements change once the requirements phase has "officially" ended

- This rate is on average 3% per month in the subsequent design phase, and should go down after that

Changing Requirements - 3

- This rate should come down to 1% per month during coding
- Ideally, this should come down to no changes in testing, however, this is very rare

Sources of Change - 1

- New business or market conditions dictate changes in product requirements or business rules

- New customer needs demand modification of data produced by information systems, functionality delivered by products, or services delivered by computer-based system

Sources of Change - 2

- Reorganization or business growth/downsizing causes changes in project priorities or software engineering team structure

- Budgetary or scheduling constraints cause a redefinition of the system or product

Why All This Modification?

- As time passes, all constituencies know more
  - About what they need
  - Which approach would be best
  - How to get it done and still make money

- **Statement of the fact: most changes are justified!**

Managing Changing Requirements ???

- Following quality assurance mechanisms can limit the damage done by changing requirements
  - Formal change management procedures
  - State-of-the-art configuration control tools
  - Requirements reviews

Main Concerns in Requirements Management

- Managing changes to agreed requirements

- Managing the relationships between requirements

- Managing the dependencies between the requirements document and other documents produced in the systems engineering process

CASE Tools for Requirements Management

- Requirements management involves the collection, storage and maintenance of large amounts of information

- There are now a number of CASE tools available which are specifically designed to support requirements management

- Configuration management tools may be adapted for requirements engineering

Requirement Management Tools

Tool	Vendor	Database- or Document-Centric
Active! Focus	Xapware Technologies, http://www.xapware.com	Database
CaliberRM	Borland Software Corporation, http://www.borland.com	Database
C.A.R.E.	SOPHIST Group, http://www.sophist.de	Database
DOORS	Telelogic, http://www.telelogic.com	Database
RequisitePro	Rational Software Corporation, http://www.rational.com	Document
RMTrak	RBC, Inc., http://www2.rbccorp.com	Document
RTM Workshop	Integrated Chipware, Inc., http://www.chipware.com	Database
Slate	EDS, http://www.eds.com	Database
Vital Link	Compliance Automation, Inc., http://www.complianceautomation.com	Document

Benefits of using Requirement Management tools

- Manage versions and changes

- Store requirement attributes

- Facilitate impact analysis

- Track requirements status

- Control access

- Reuse requirements

Requirements Change Factors - 1

- Requirements errors, conflicts and inconsistencies
- Evolving customer/end-user knowledge of the system
- Technical, schedule or cost problems

Requirements Errors, Conflicts and Inconsistencies

- As requirements are analyzed and implemented, errors and inconsistencies emerge and must be corrected. These may be discovered during requirements analysis and validation or later in the development process

Evolving Customer/End-user Knowledge of the System

- As requirements are developed, customers and end-users develop a better understanding of what they really require from a system

Technical, Schedule or Cost Problems

- Problems may be encountered in implementing a requirement. It may be too expensive or take too long to implement certain requirements

Requirements Change Factors - 2

- Changing customer priorities

- Environmental changes

- Organizational changes

Changing Customer Priorities

- Customer priorities change during system development as a result of a changing business environment, the emergence of new competitors, staff changes, etc.

Environmental Changes

- The environment in which the system is to be installed may change so that the system requirements have to change to maintain compatibility

Organizational Changes

- The organization which intends to use the system may change its structure and processes resulting in new system requirements

Stable and Volatile Requirements - 1

- Requirements changes occur while the requirements are being elicited, analyzed and validated and after the system has gone into service

- Some requirements are more stable, while others may be more subject to change than others

Stable and Volatile Requirements - 2

- Stable requirements are concerned with the essence of a system and its application domain. They change more slowly than volatile requirements

- Volatile requirements are specific to the instantiation of the system in a particular environment and for a particular customer

Types of Volatile Requirements

- Mutable requirements

- Emergent requirements

- Consequential requirements

- Compatibility requirements

Mutable Requirements

- These are requirements which change because of changes to the environment in which the system is operating

Emergent Requirements

- These are requirements which cannot be completely defined when the system is specified but which emerge as the system is designed and implemented

Consequential Requirements

- These are requirements which are based on assumptions about how the system will be used. When the system is put into use, some of these assumptions will be wrong

- Requirements that result from the introduction of the computer system. Introducing the computer system may change the organization's processes and open up new ways of working which generate new system requirements.