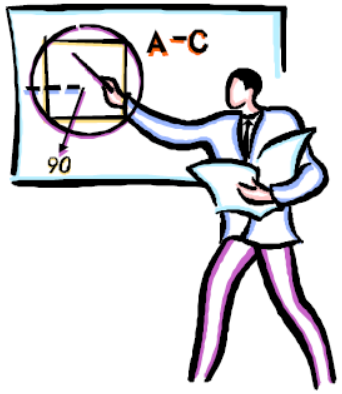
VIII. Requirements Analysis

Functional and Non-Functional Requirements

Stakeholders

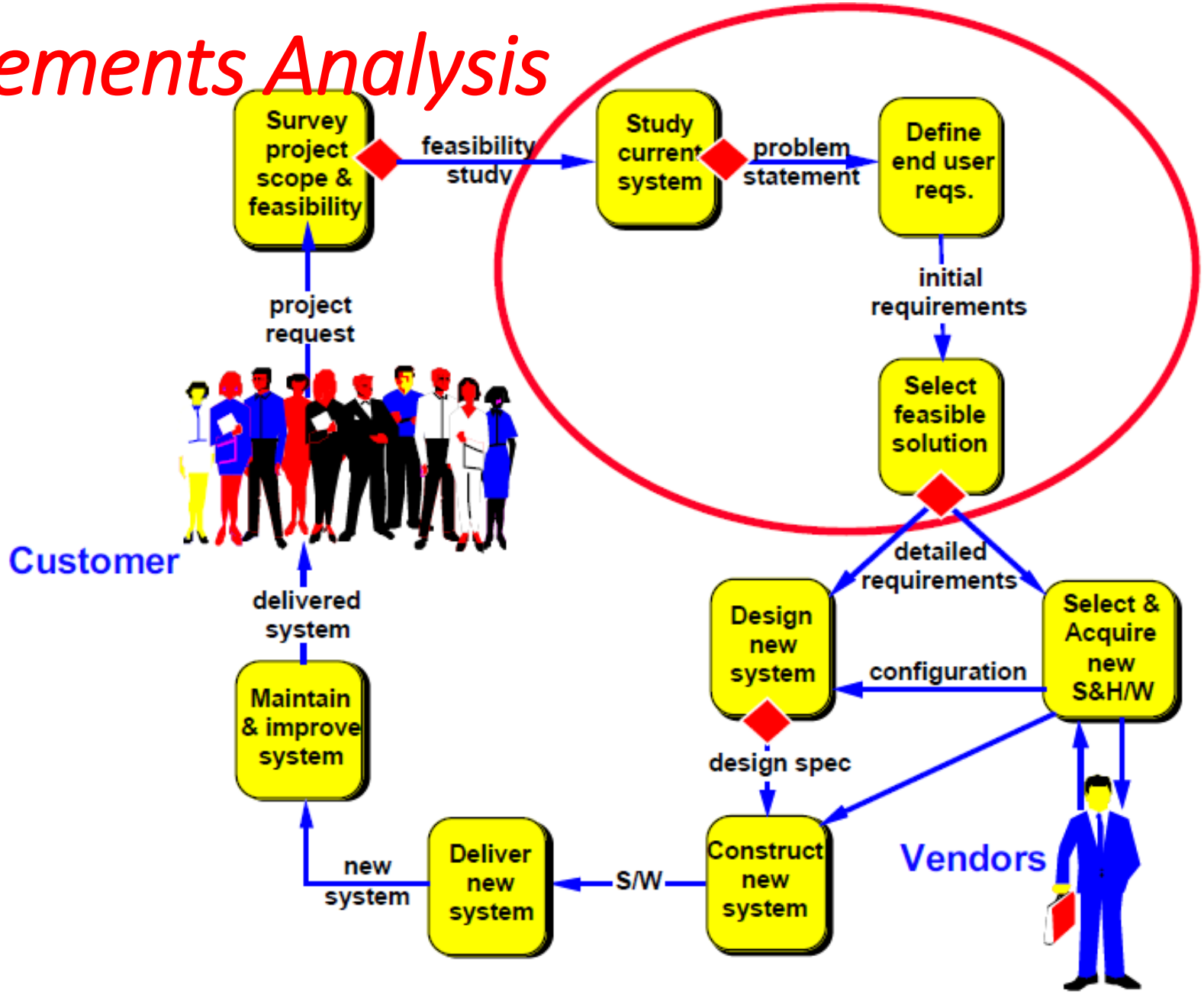
From Whom Do We Gather Requirements?

How Do We Specify Them?



Presentation: N.C. Danh

Requirements Analysis



What Are Requirements?

"...Requirements definition is a careful assessment of the needs that a system is to fulfill...must say ***why*** a system is needed, based on current and foreseen conditions, which may be internal operations or an external market...must say ***what*** system features will serve and satisfy this context...must also say ***how*** the system is to be constructed..."

[Ross77]

- Requirements represent a specification for the new system.
- Effectively a "contract" between client and developer
- We usually distinguish between
  - ✓ ***Functional requirements***, which describe functions that the new system must support;
  - ✓ ***Non-functional*** (or, ***quality***) ***requirements***, which impose global constraints on the system;

Functional Requirements

- Describe the **processing** required from the new system;
- Describe the **inputs** into the system from paper forms and documents, from interactions with people, such as email messages, and from other systems;
- Also describe the **outputs** that are expected from the system in the form of printed documents, screen displays and data transfers to other systems,
- Finally, they describe the **data that must be held in, and managed** by the system so that it can fulfill its required functions.

Functional requirements describe the system with respect to its environment, NOT its internal workings!

Non-Functional Requirements

- Describe aspects of the system that are concerned with how well it supports the functional requirements (hence the name non-functional, or quality requirements).
- This description may include:
  - ✓Performance criteria such as desired response times for updating data in the system or retrieving data from the system;
  - ✓Reliability requirements, e.g., the system must crash on average once every 6 months;
  - ✓Security considerations, e.g., access rights for different groups of users;
  - ✓Standards the working systems should meet;
  - ✓Usability requirements, such as: users will be able to use the system after 2 days of training;
  - ✓…more...

Bill Gates on Non-Functional Requirements

'Products should emphasize security right out of the box‘ January 17, 2002 Posted: 8:54 AM EST (1354 GMT)

WASHINGTON (AP) -- Microsoft's chairman, Bill Gates, is steering his software empire onto a new strategic heading, putting security and privacy ahead of new capabilities in the company's products.

In an e-mail to employees obtained by the Associated Press, Gates refers to the new philosophy as "Trustworthy Computing” and says his highest priority is to ensure that computer users continued to venture safely across an increasingly Internet-connected world.

Importance of Requirements Analysis

- Most errors (54%) are detected ***after*** coding and testing.
- Almost half of all errors in software (45%) are in requirements and design.
- Most errors made during requirements analysis are nonclerical (77%) and may arise because of incorrect facts, misunderstandings, inconsistencies, omissions and ambiguities.
- Errors in requirements which are detected after coding are generally very expensive to fix (up to 200 times the cost of error caught during requirements analysis.)
- Requirements errors can be detected, because inspection techniques have proven most effective for any software, and inspection techniques can be applied to requirements as well as design and code.

Relative Cost of Repair

Stage	Relative Cost
Requirements	0.1 - 0.2
Preliminary Design	0.5
Coding	1.0
Unit Testing	2.0
Acceptance Test	5.0
Maintenance	20.0

Are Requirements Always Done in Software Engineering Practice?

Whom Do We Gather Requirements From?

From the ***stakeholders*** (***actors***):

- ✓Users - who are concerned about the features and the functionality of the new system;
- ✓Designers;
- ✓Systems analysts;
- ✓Training and user support staff;
- ✓Business analysts;
- ✓Technical authors;
- ✓The project manager;
- ✓…more…

Stakeholders are Different for Different Types of Projects

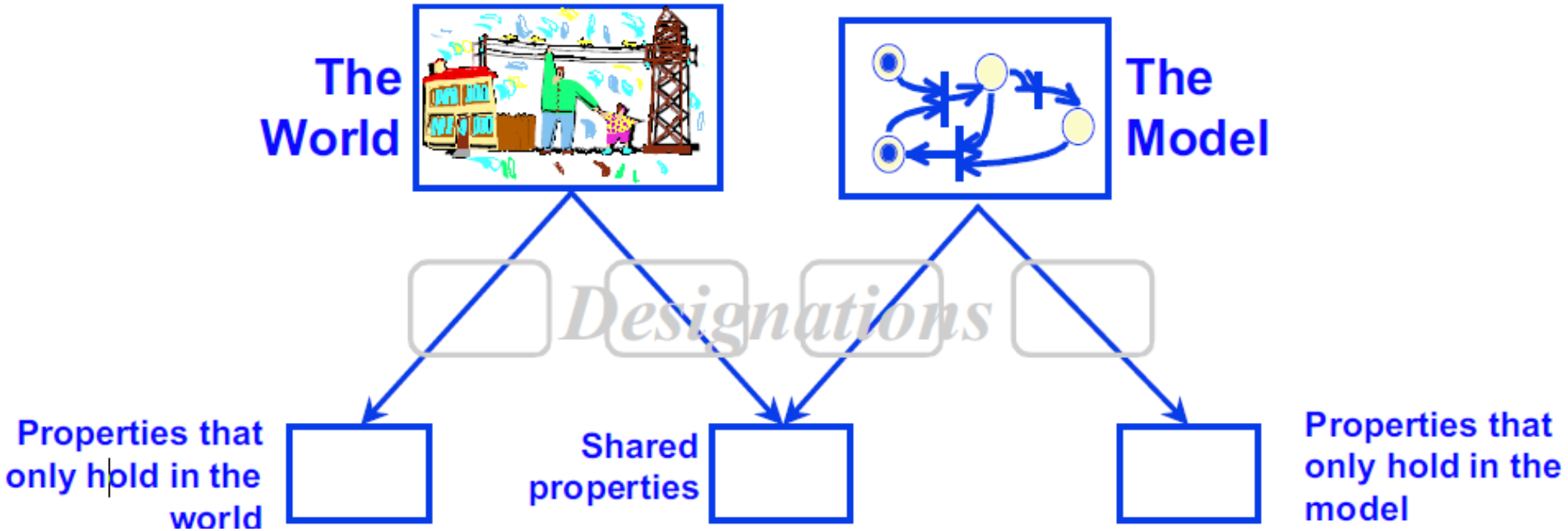
- ***Customer-driven*** projects involve customers who need a system that solves a particular problem; such projects are one-of projects
- ***Market-driven*** projects involve a developer who decides to develop a (generic) system that is to be sold in the market; often hard to determine for such projects what the customer really wants (...or, for that matter, who the customer really is)
- (Coming soon) ***User-driven*** projects involve a system which is used, for a fee, by a number of users; owner of the system has to evolve it according to user demands
- The concept of software is evolving from that of a ***custom-built artifact***, to that of a ***commodity*** that you buy, and soon to that of a ***resource*** that you use.

What Do We Gather?

- ***Scenarios*** (***use cases***) from which we can infer functional and non-functional requirements.
- Scenarios describe desirable sequences of events that should be supported by the new system.
- They also describe undesirable ones that should be prevented.

How Do We Specify Requirements?

- Through (visual) modeling



But Remember:

A Model is Usually just an Approximation!

Additional Readings

- [Kotonya98] Kotonya, G. et all. *Requirements Engineering: Processes and Techniques*, John Wiley & Sons, 1998.
- [Macaulay96] Macaulay, L., *Requirements Engineering*, Springer-Verlag, 1996.