QOS

Understanding Quality Attribute

Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives.”

- Will A. Foster

System Quality Attribute

- Performance
- Availability
- Usability
- Security

End User's view

- Time To Market
- Cost and Benefits
- Projected life time
- Targeted Market
- Rollout Schedule
- Integration with Legacy System

Business Community view

40% of the cost of developing systems is taken up by testing (CSCE 747)

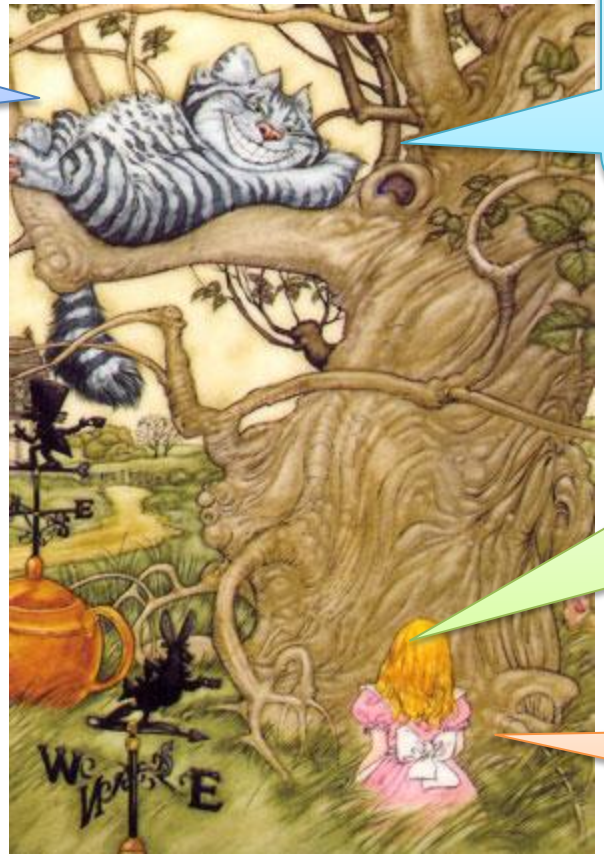
- Maintainability
- Portability
- Reusability
- Testability
- Interoperability

Developer's view

”Quality cannot be tested into the product;
it has to be designed in to it.”

-- Albin

Alice It depends upon where you wish to go

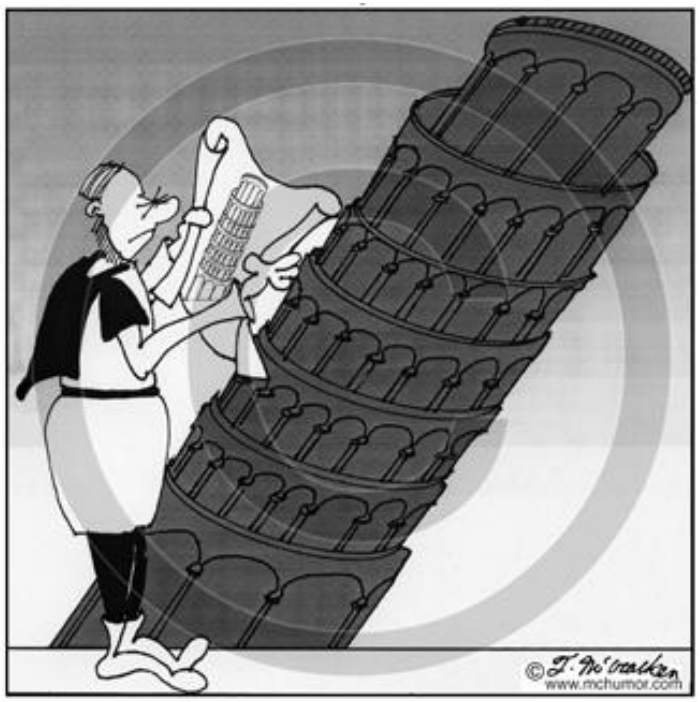


Then it doesn't matter which way you walk

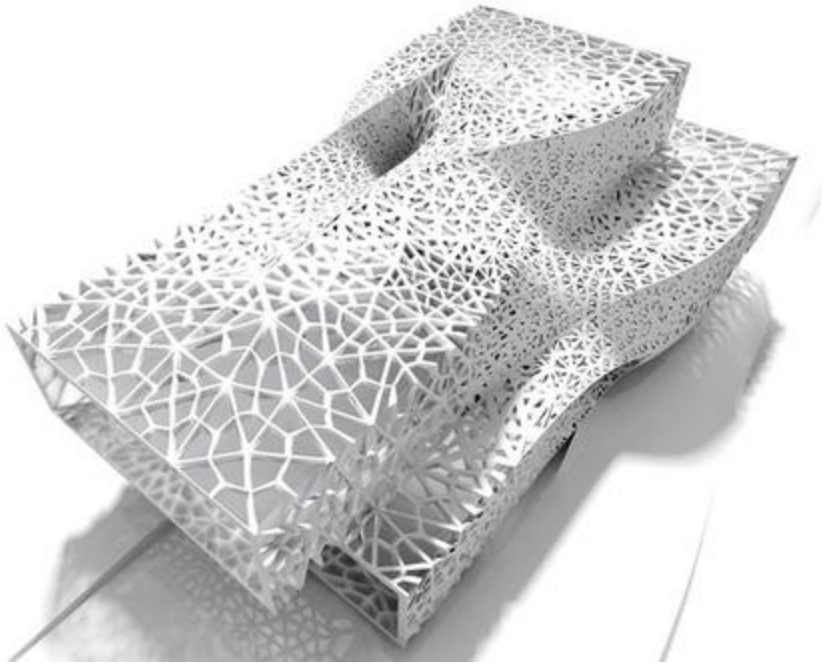
Cheshire which direction Should I go

I don't know

If the sponsor of a system cannot tell you what any of the quality goals are for the system, then any architecture will do.



Architecture is critical to the realization of qualities of interest in a system, and these qualities should be designed in to it

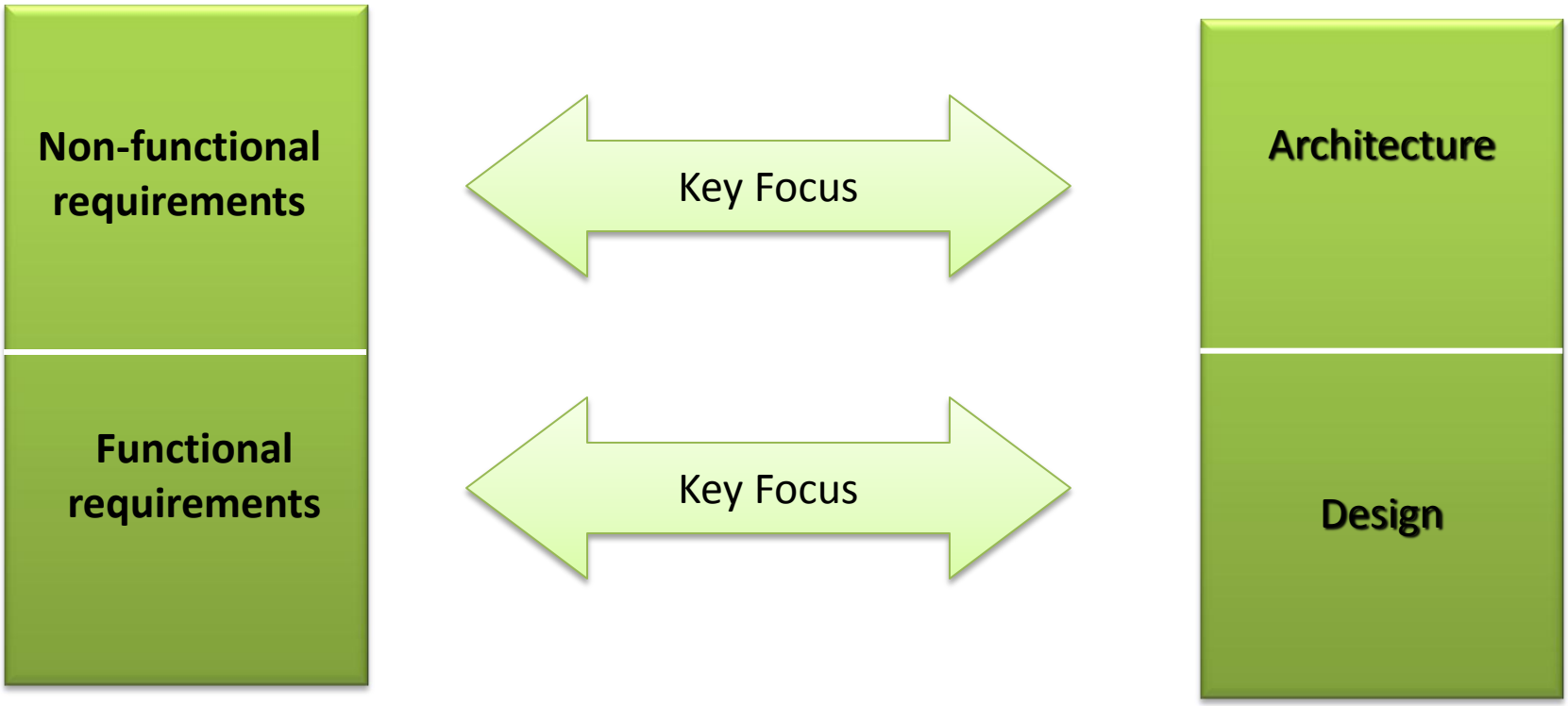


Functionality is largely independent of structure. It is the quality attributes that constrain the structure.

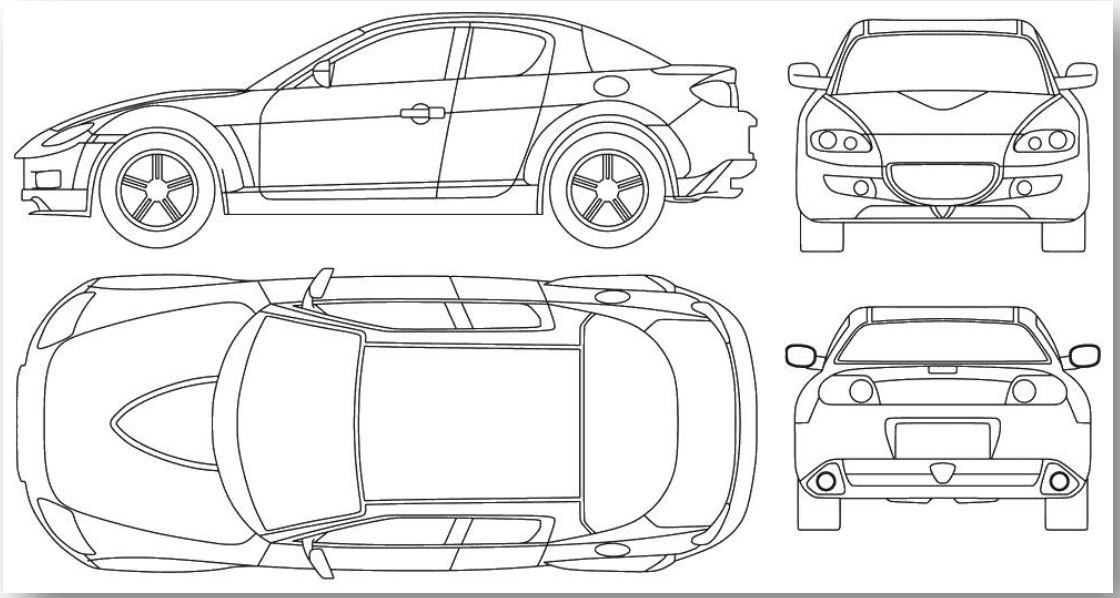
Simply put, quality attribute requirements influence a software architecture in a big way

Architecture is defined as *the set of strategic design decisions that affect most or all of the system.*

Architecture vs. Design



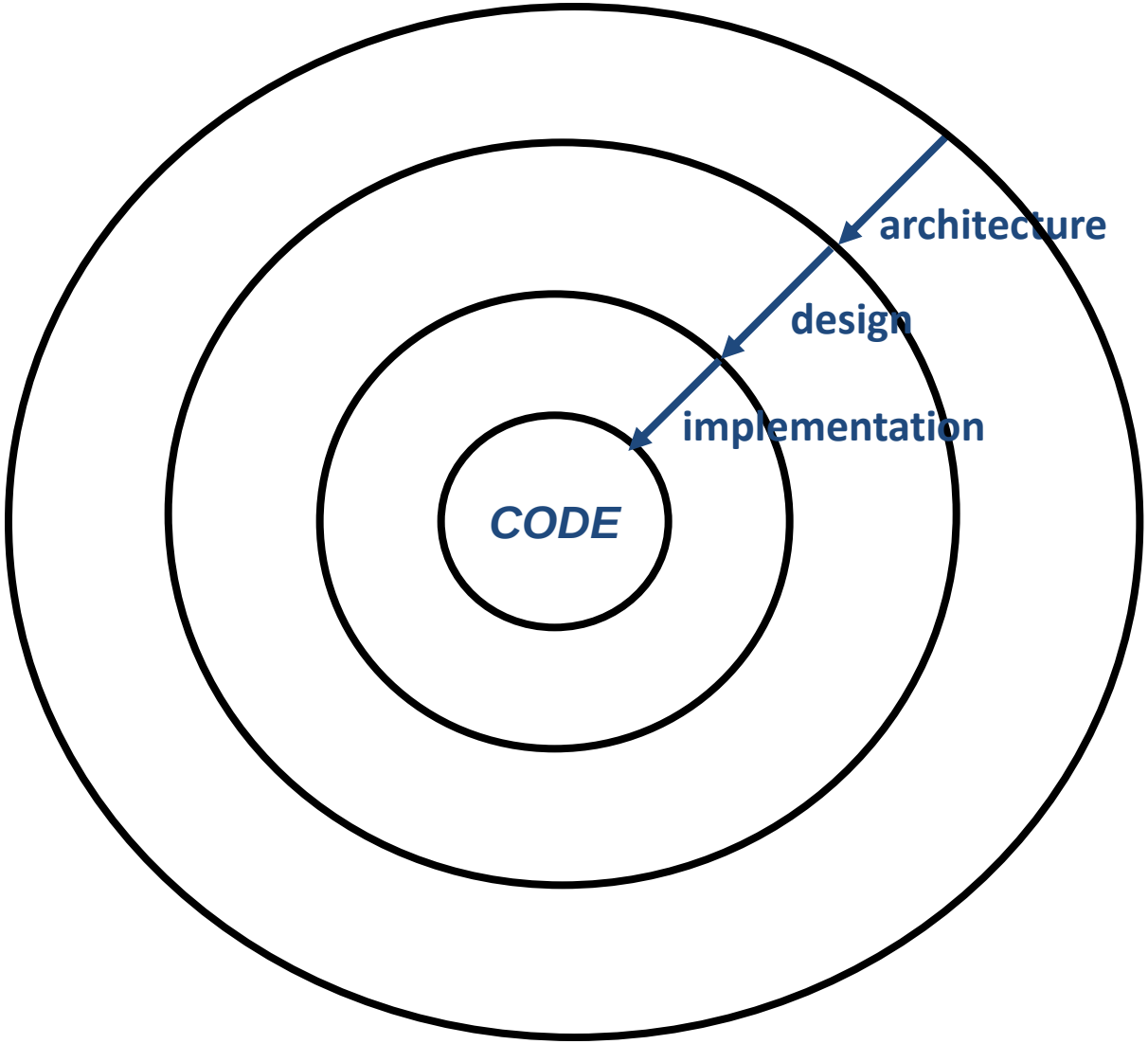
Architecture is design



All architecture is design, but not all design is architecture

Architecture focuses on ***significant*** **design**

Architecture provides the foundation for achieving quality, but this foundation will be of no use if attention is not paid to the details.



Achieving quality attributes must be considered throughout Architecture, design, implementation, and deployment.

Within complex systems, quality attributes can never be achieved in isolation.

The achievement of one Quality would have effect on the achievement of other Quality.

Keeping the backup database affects **performance** also so it’s a **trade-off** between reliability and **performance**

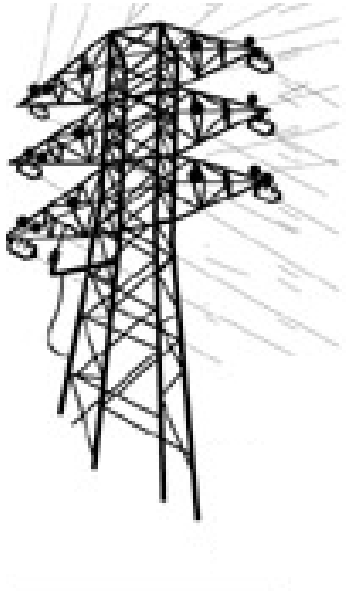
The system shall be robust

The system shall be highly modifiable

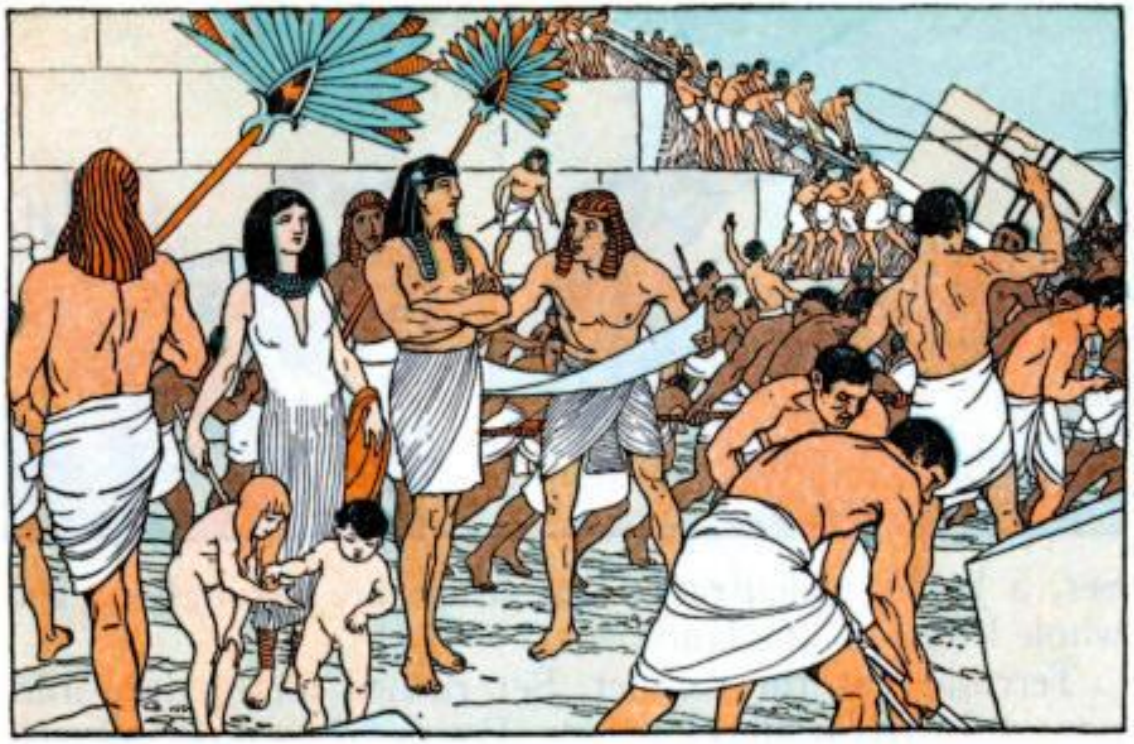
The system shall be secure from unauthorized break-in

The system shall exhibit acceptable performance

Without elaboration, each statements is subject to interpretation and misunderstanding.



No system can ever be completely reliable
under all circumstances.



It is incumbent upon the architect to understand under exactly what circumstances the system should be reliable in order to be deemed acceptable

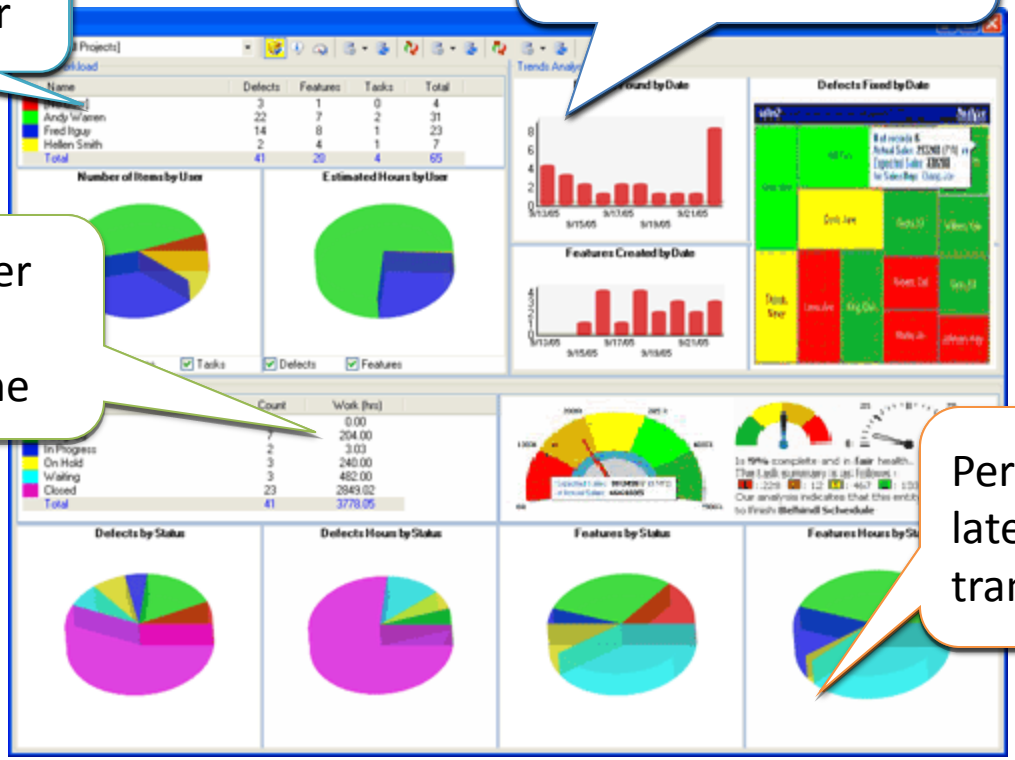
Is the system modifiable?

1. Background color of the user interface is changed merely by modifying a resource file.

2. Dozens of components must be changed to accommodate a new data file format.

Availability : % of uptime in a year

Security : Threat List, Vulnerability List



Reliability : faults per thousand lines of code, Execution time

Performance : Data latency and transaction tps

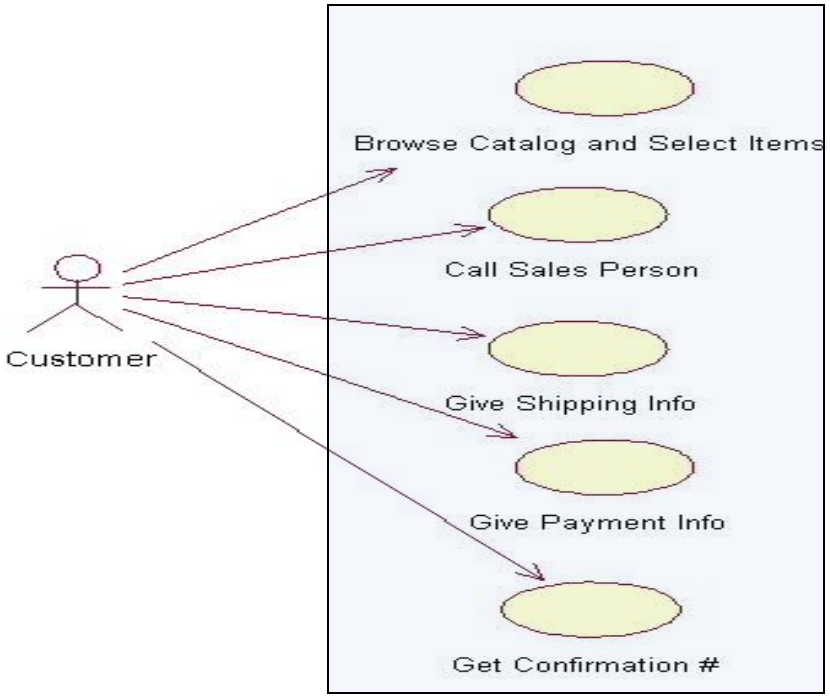
Each quality attribute as an associated set of metrics

Quality Attributes Are Too Vague for Analysis

Scenarios

A scenario is a brief description of a stakeholder's interaction with a system

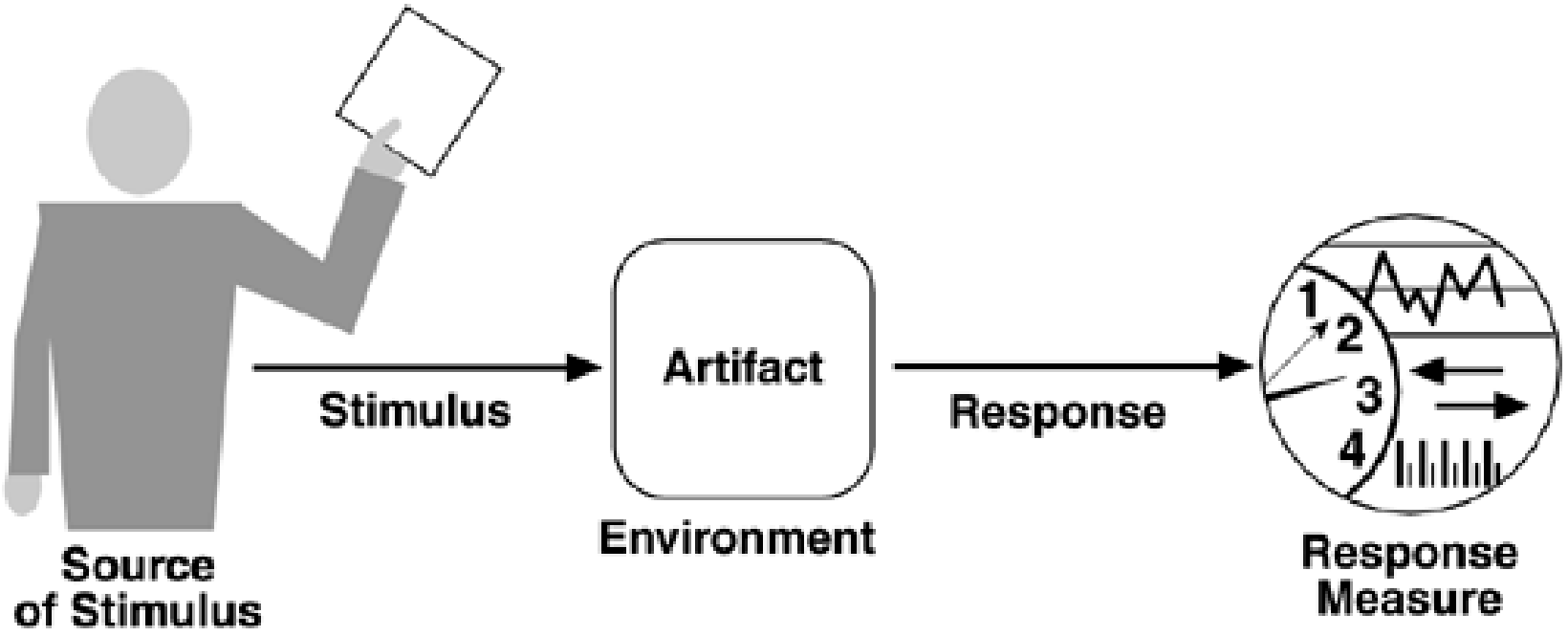
Quality Attribute Scenario



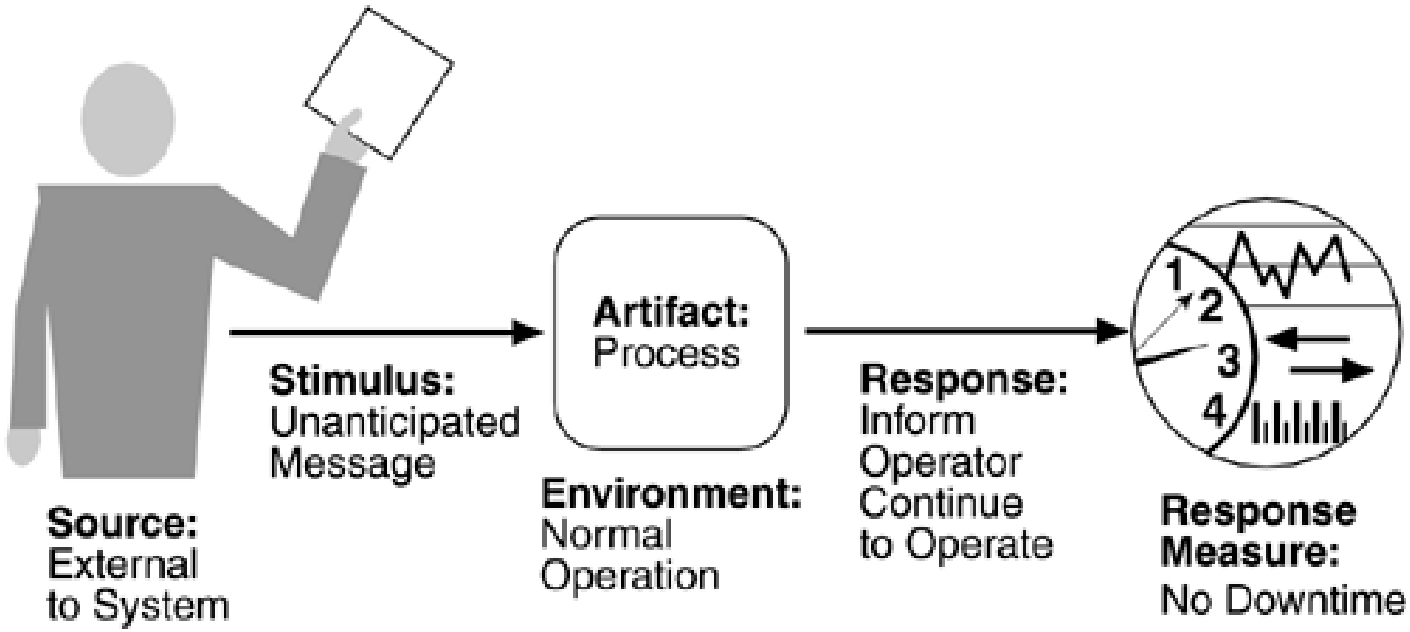
Use cases capture Functional Requirements, Quality Attribute Scenarios capture Non functional requirements.

Source	Actor who generated stimulus
Stimulus	Something causing a response
Artifact	The system or some pieces of it which is Stimulated.
Environment	conditions in which stimulus occurs
Response	Action undertaken after the arrival of the stimulus
Response Measure	Measure

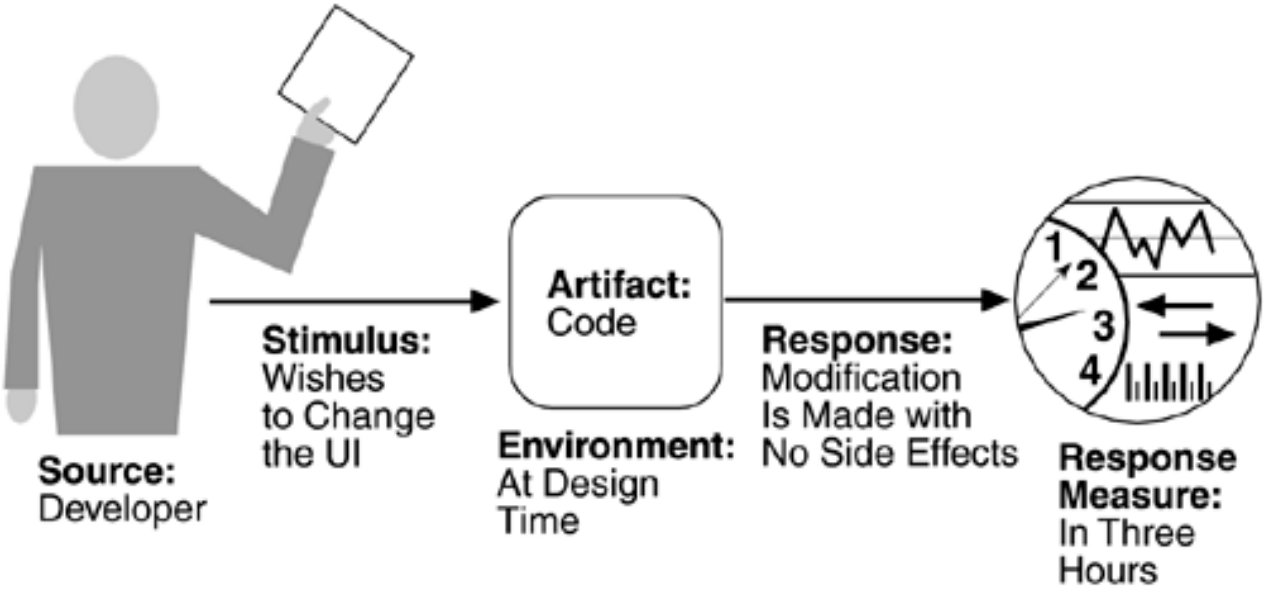
CAPTURES quality attribute information in the six-part scenario format what otherwise would be unstructured text descriptions of nonfunctional requirements.


Source
of Stimulus
Stimulus
Artifact
Environment
Response
1
2
3
4
Response
Measure

Availability



Modifiability



Source	User
Stimulus	User submits an order for a package to the Consumer Web site.
Artifact	Adventure Builder system and the Bank
Environment	Normal operation
Response	The Consumer Web site notifies the user that the order has been successfully submitted and is being processed by the OPC.
Response Measure	The system responds to the user in less than five seconds.

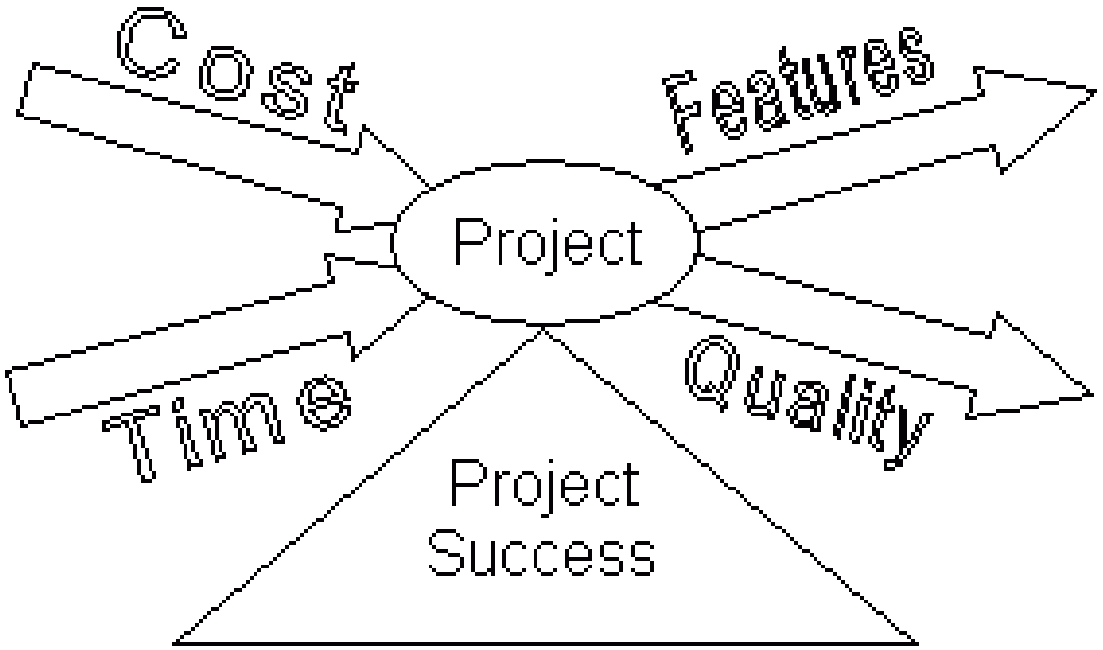
Scenario:		
Business Goals:		
Relevant Quality Attributes:		
Scenario Components	**Stimulus:**	Trigger
	Stimulus Source:	Actor
	Environment:	Pre Condition
	Artifact (If Known):	System
	Response:	Post Condition
	Response Measure:	Measure
Questions:		
Issues:		

Scenario Refinement for Scenario N	
Scenario(s):	When a garage door opener senses an object in the door's path, it stops the door in less than one millisecond.
Business Goals:	safest system; feature-rich product
Relevant Quality Attributes:	safety, performance
Stimulus:	An object is in the path of a garage door.
Stimulus Source:	object external to system, such as a bicycle
Environment:	The garage door is in the process of closing.
Artifact (If Known):	system's motion sensor, motion-control software component
Response:	The garage door stops moving.
Response Measure:	one millisecond
Questions:	How large must an object be before it is detected by the system's sensor?
Issues:	May need to train installers to prevent malfunctions and avoid potential legal issues.

4 ways to Generate Quality Attribute Scenario

1. Scenario Brain Storming
2. Utility Tree
3. Scenario generation tables
4. Quality Models

Product quality is not only the component for project success.



Project success is delivering the features and quality the customer desires at a cost and schedule that is acceptable.

Architectural decisions are the most fundamental decisions; changing them will have significant ripple effects.

The surest foundation of a manufacturing concern is quality. After that, and a long way after, comes cost.

- Andrew Carnegie