Software System Architectures (NSWI130)
Quality Attributes

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Kinds of requirements

- functional requirements

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- functional requirements
- quality requirements
  - e.g. performance, reliability, security, availability, modifiability, interoperability, testability, interoperability, ...

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- functional requirements
- quality requirements
  - e.g. performance, reliability, security, availability, modifiability, interoperability, testability, interoperability, ...
- (system) constraints

Functionality and quality

- functionality often takes the only seat in the development scheme
- software projects fail not because the lack of functionalities but because of their low quality

Functionality and quality

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Functionality and quality

- functionality may be achieved through the use of different architectural structures
- quality attributes can never be achieved in isolation
- one attribute influences other attributes
  - e.g. performance vs maintainability

Quality of Software Architecture

- new definition of software architecture from qualitative point of view:

"Software architecture is mapping of system's functionality onto software structures that determines the architecture's support for qualities."

Quality Attribute Definition

- A quality attribute (QA) is a measurable or testable property of a system that is used to indicate how well the system satisfies a quality requirement of a stakeholder
- QA = measure of “goodness” of a system’s functionality along some dimension of interest of a stakeholder

Quality Attributes Examples

"When the user presses the green button the options dialog appears"

- performance QA - how quickly the dialog will appear

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"When the user presses the green button the options dialog appears"

- performance QA - how quickly the dialog will appear
- availability QA - how often the function will fail and how quickly it will be repaired
- usability QA - how easy it is to learn this function, and how easy it is to locate this function for the user, how easy it is to revert the function

Achieving Quality Attributes

- quality attributes must be considered throughout analysis, design, implementation, and deployment
- quality attributes may involve architectural but also non-architectural aspects

Achieving Performance

Performance measures how long it takes to respond to requests.

- communication among components (**architectural**)
- functionality allocated to components (**architectural**)
- shared resources allocation (**architectural**)
- chosen algorithms (**non-architectural**)
- how algorithms are coded (**non-architectural**)

Achieving Modifiability

Modifiability measures how easily system can be changed.

- division of functionality (**architectural**)
- coding techniques (**non-architectural**)

Achieving Quality Attributes

Usability measures how easily a user can accomplish a desired task.

- clear and easy to use user interface **(non-architectural)**
- ability to cancel or undo operations **(architectural)**
- ability to re-use previously entered data **(architectural)**

Role of Architecture

- architecture is critical for many qualities
- architecture, by itself, is unable to achieve qualities
  - it provides the foundation for achieving qualities, but attention must be also paid to the non-architectural details

Quality Attributes Classification

system quality attributes

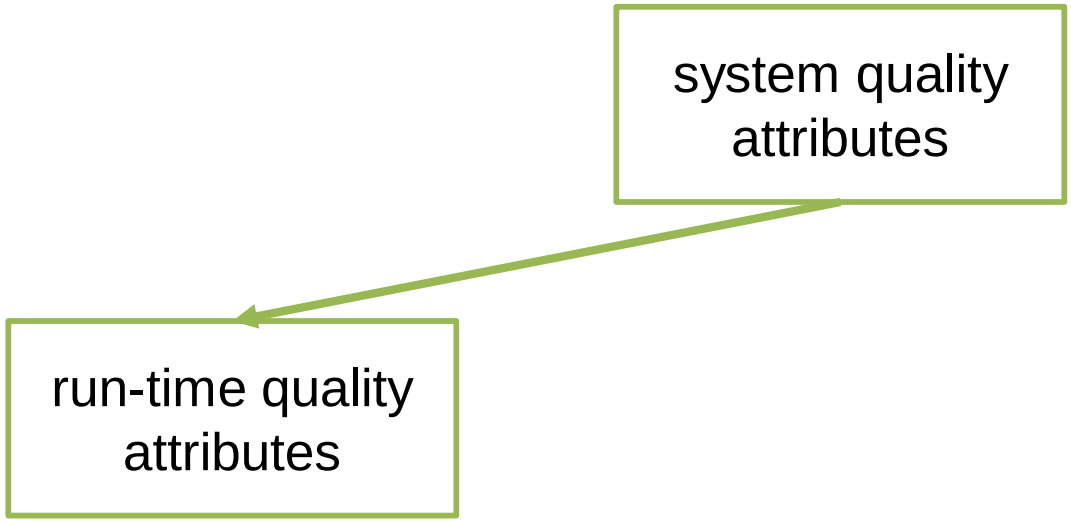
business quality attributes

architectural quality attributes

Quality Attributes Classification

system quality attributes

Quality Attributes Classification



- availability
- performance
- security
- usability
- ...

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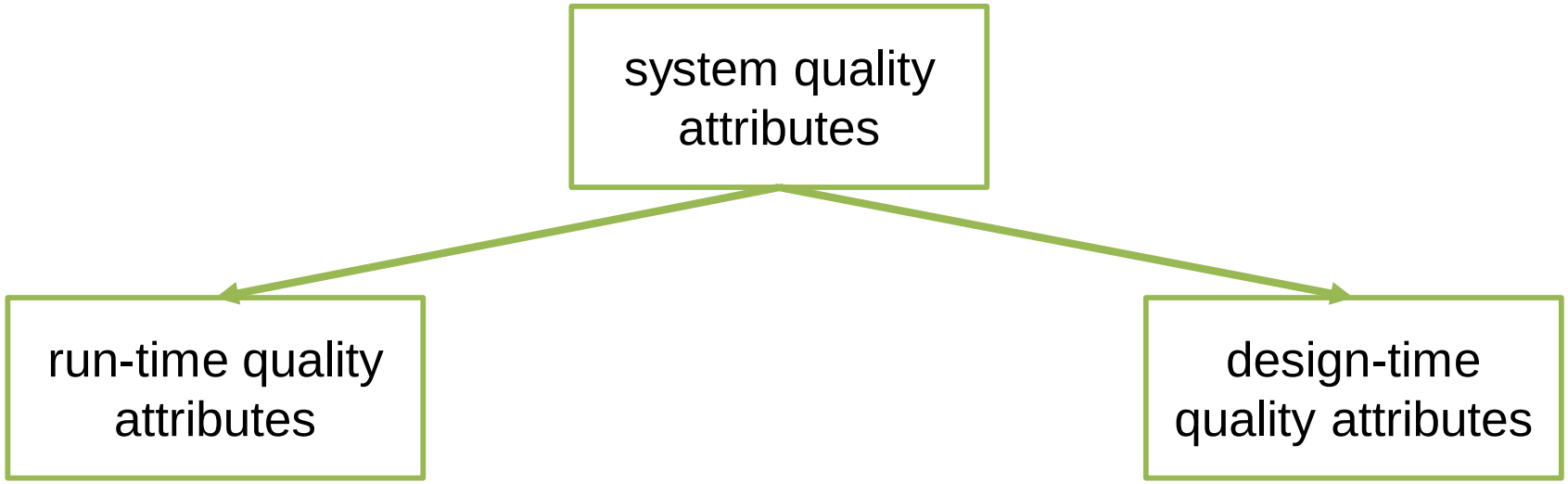


- availability
- performance
- security
- usability
- ...

- modifiability
- portability
- testability
- reusability
- integrability
- ...

Quality Attributes Classification

business quality attributes

- time to market
- cost/benefit
- legacy systems reuse
- ability to outsource
- ...

Quality Attributes Classification

architectural quality attributes

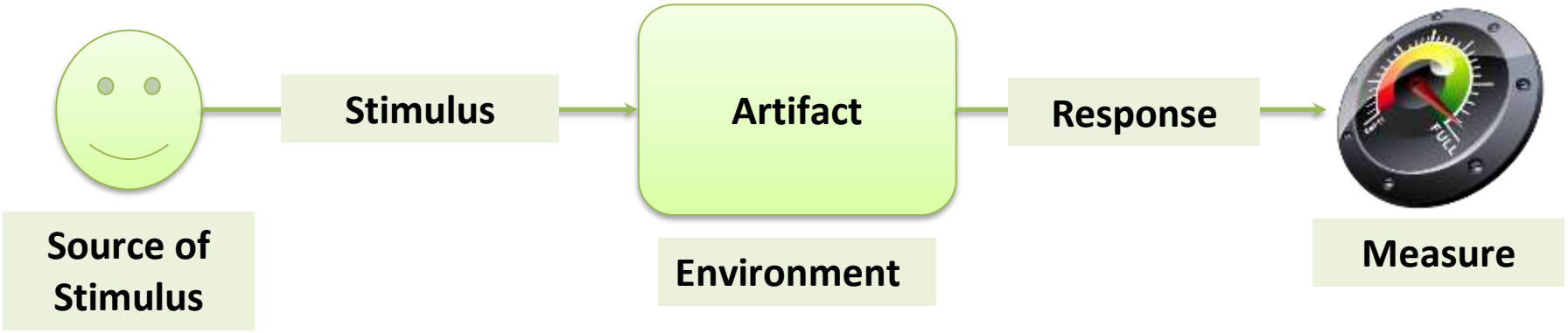
- correctness
- completeness
- buildability
- conceptual integrity

Specifying Quality Requirements

- quality attributes do not specify quality requirements
  - it is meaningless to say that system is modifiable

- it may be not clear to which quality attribute a particular aspect belongs to
  - Is system failure an aspect of performance, availability, security, or usability?

Quality Attribute Requirement Scenario



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