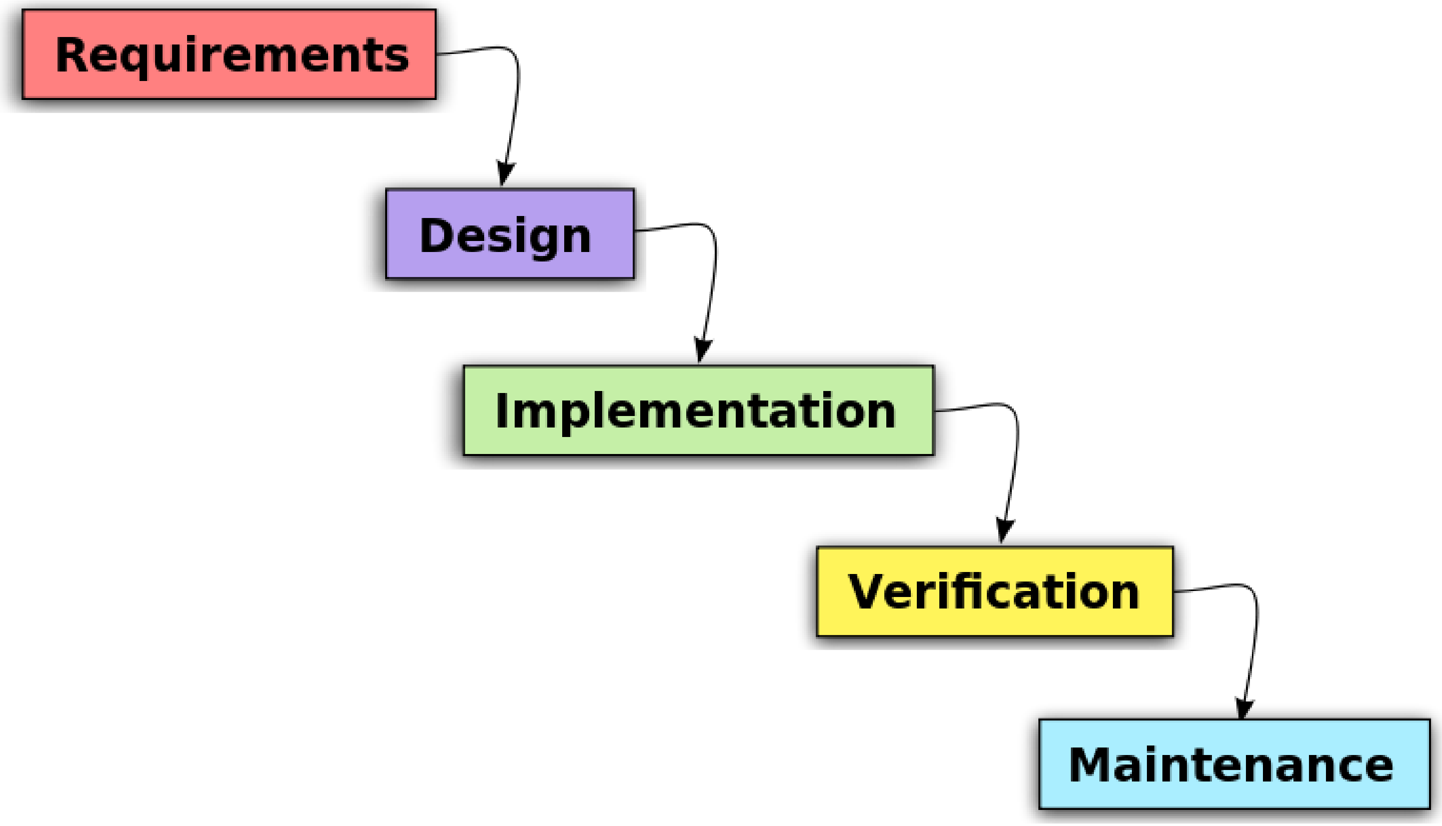
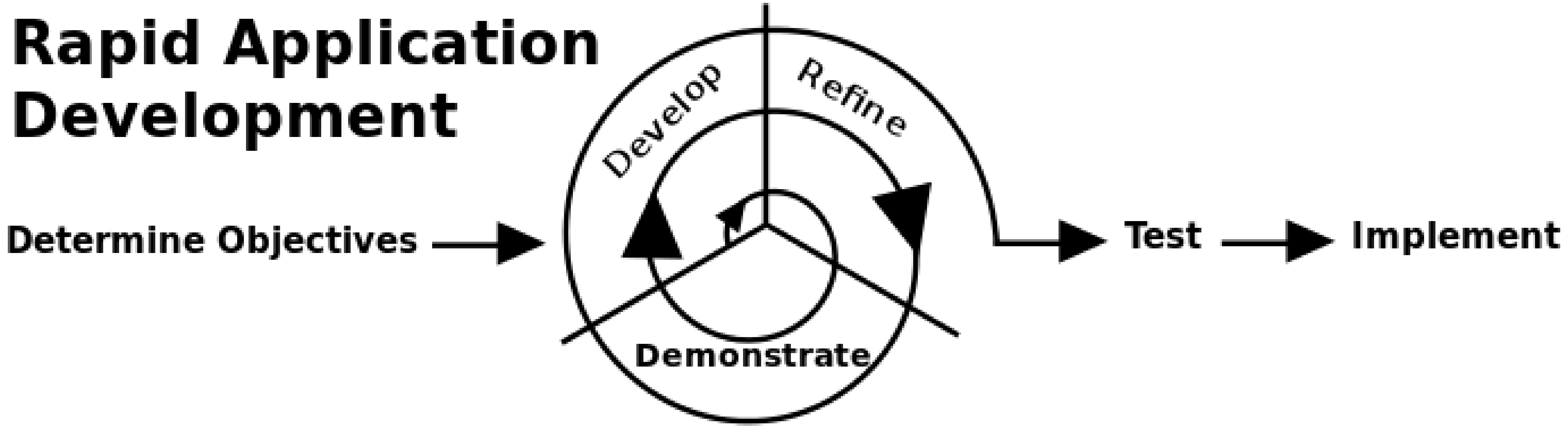
The Life of a Program

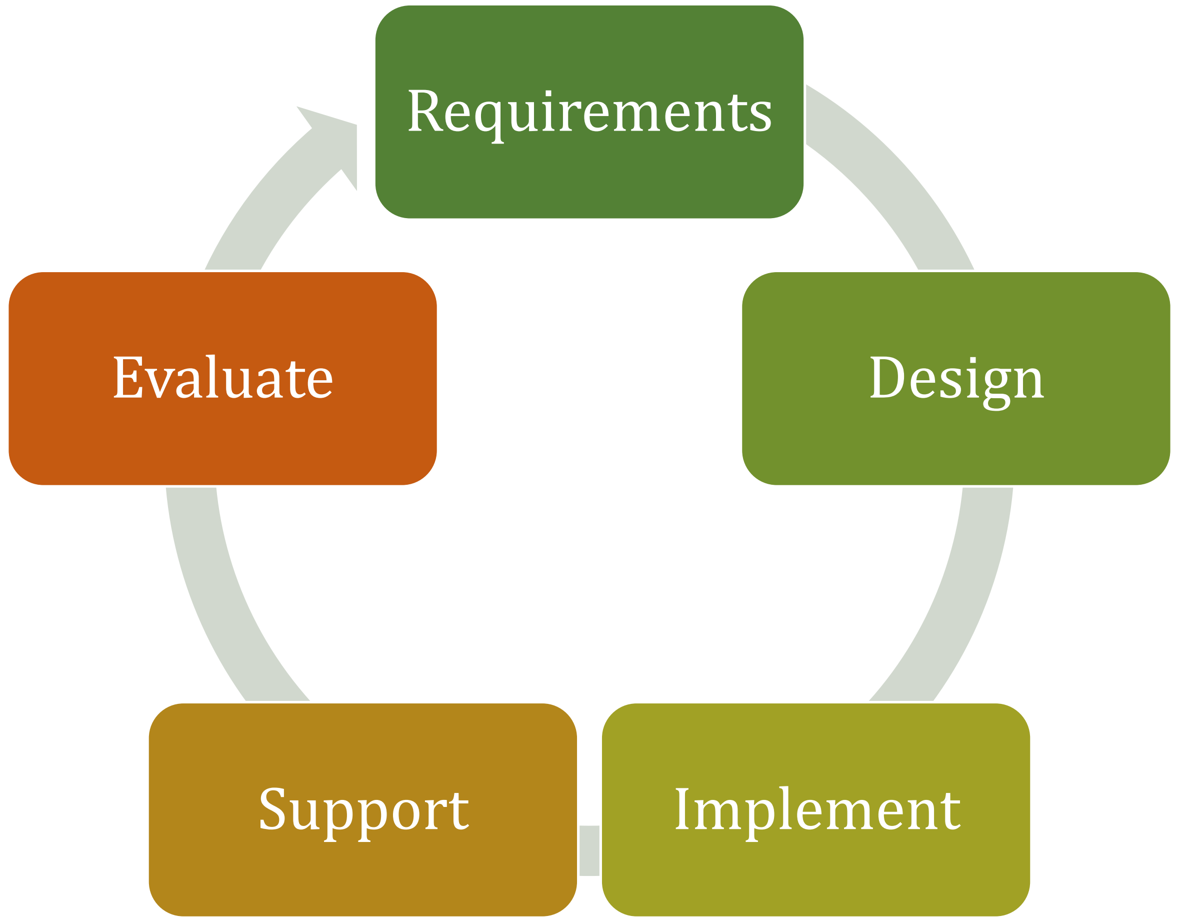
Waterfall Software Development Model



Rapid Prototype Software Dev. Process

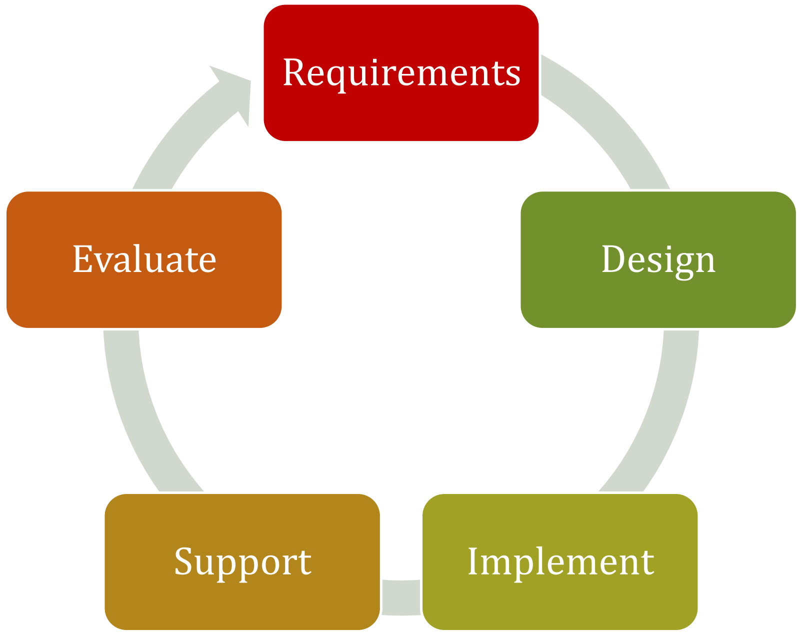


Typical Life Cycle of an Application



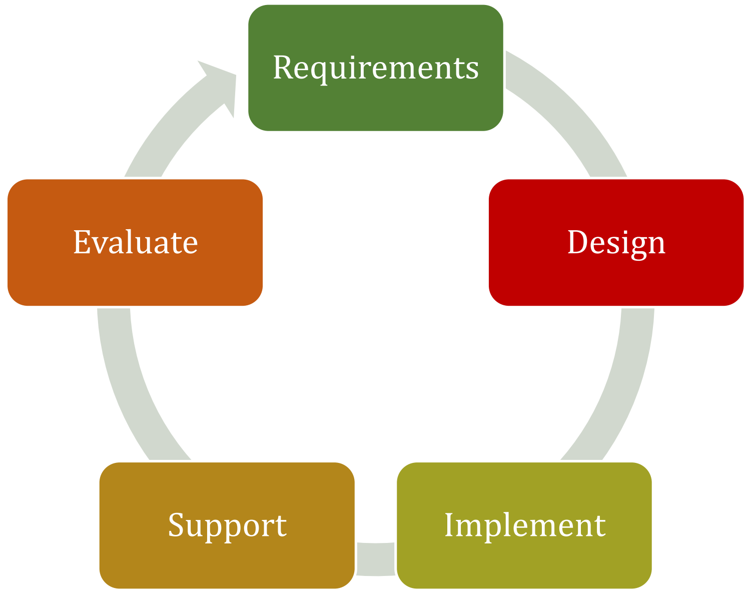
Requirements

- What does your application need to do?
- What is the input data for your application
- What data will it produce?



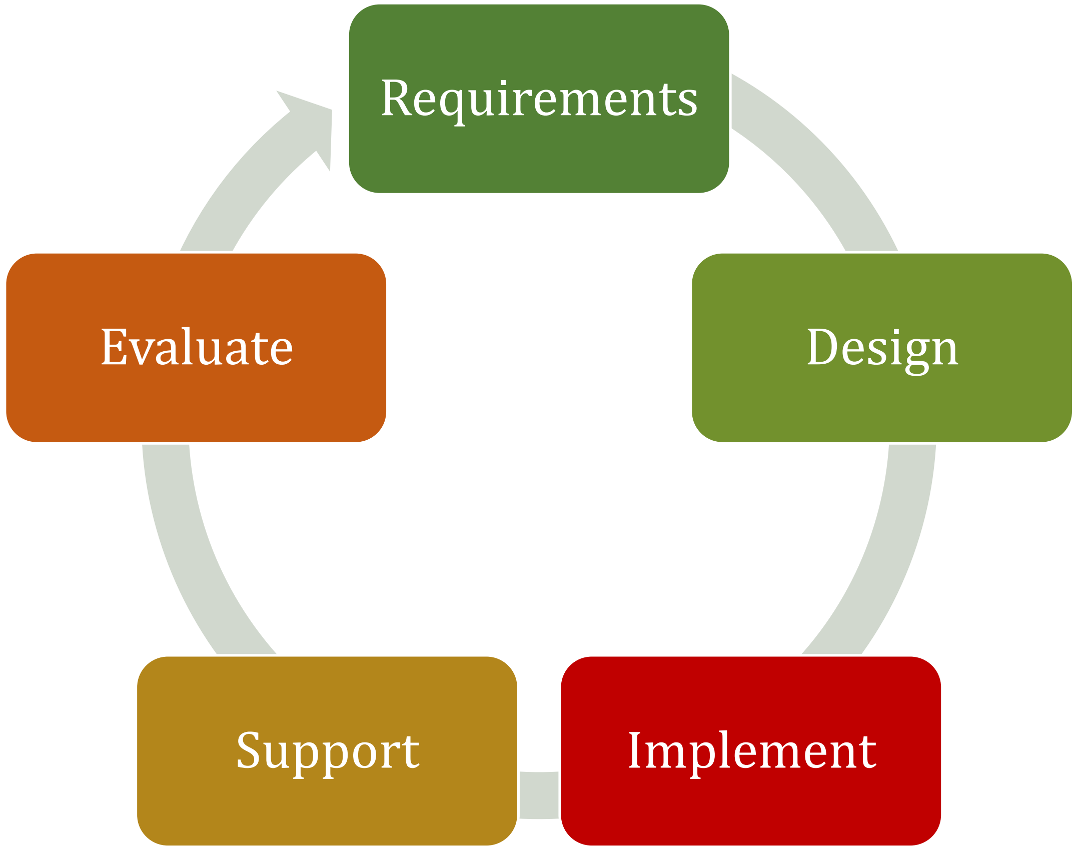
Design

- Before you write code
- What are the components of your application?
  - What functions will you need?
  - What data structures will you use?
- How will the components fit together?
  - What functions call what other functions
  - How does the data flow?



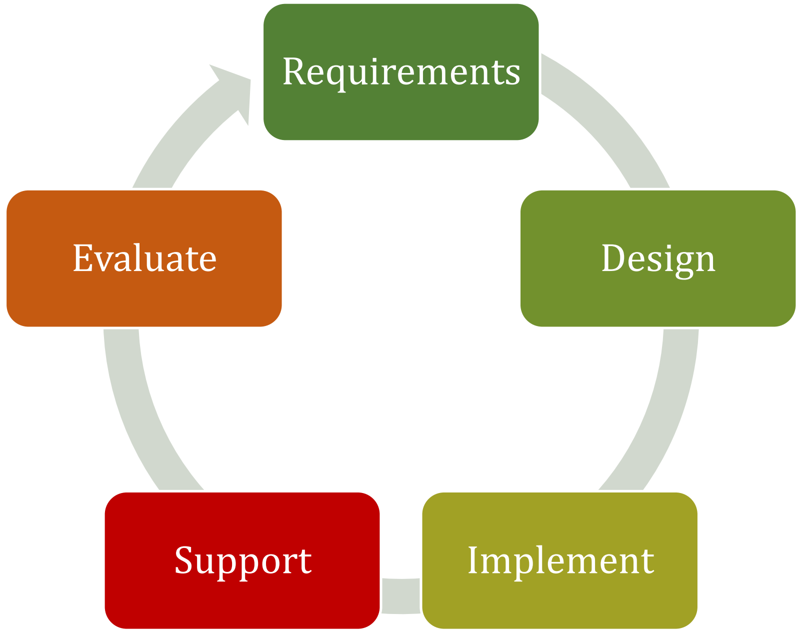
Implementation

- Code
- Test
- Document
- Debug



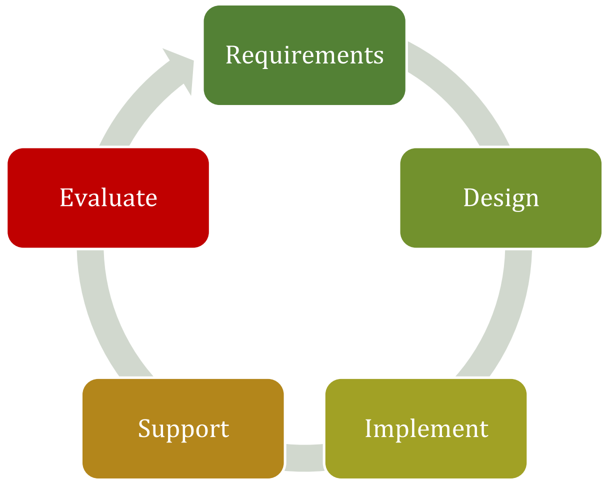
Support

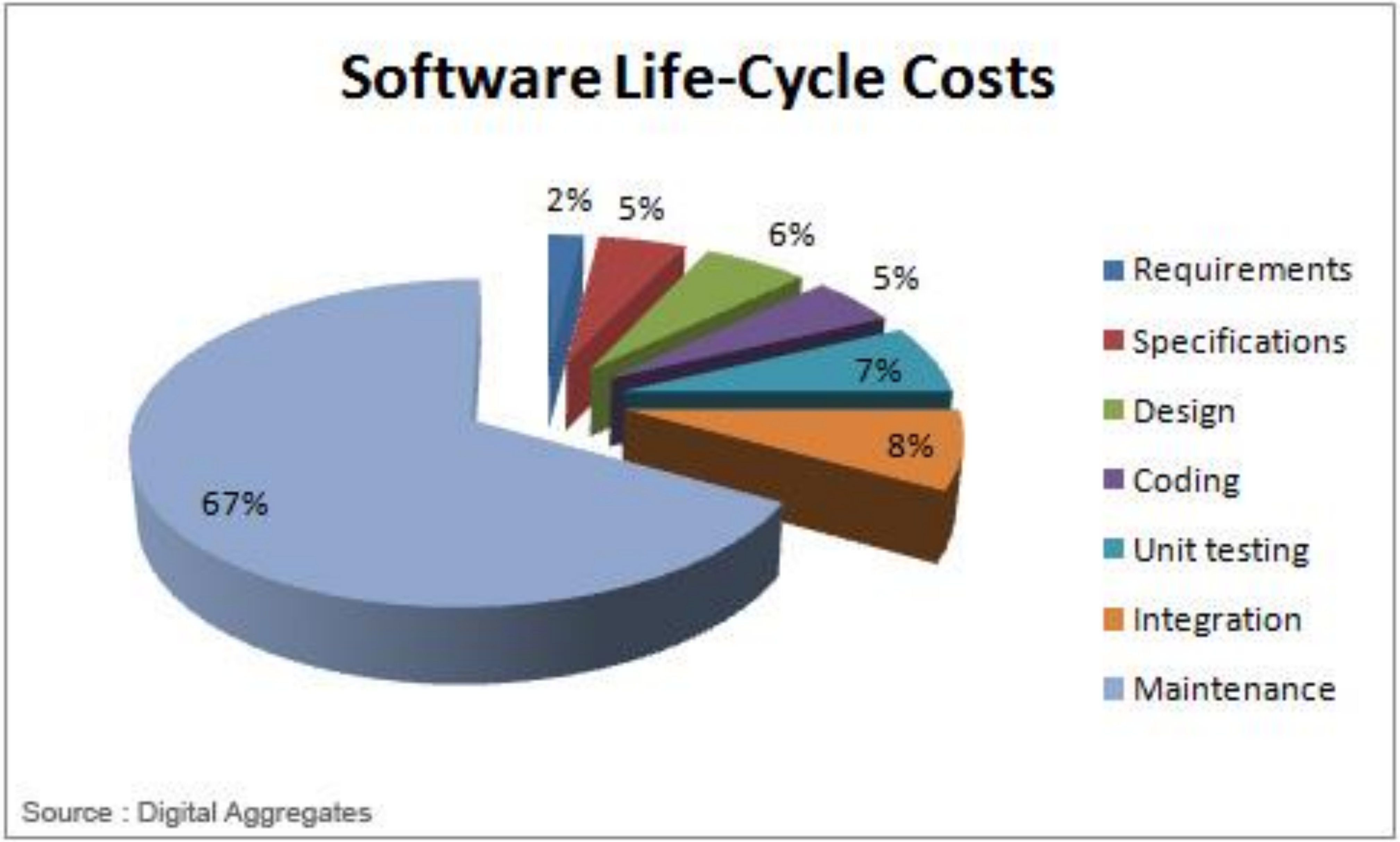
- Fix problems not found during testing
- Fix new problems that occur because your code was used in a way you didn't expect it to be used.
- Help customer use your code correctly
  - Provide valid input data
  - Interpret the results correctly
- Variety of support methods
  - Documentation
  - Direct communication with customer



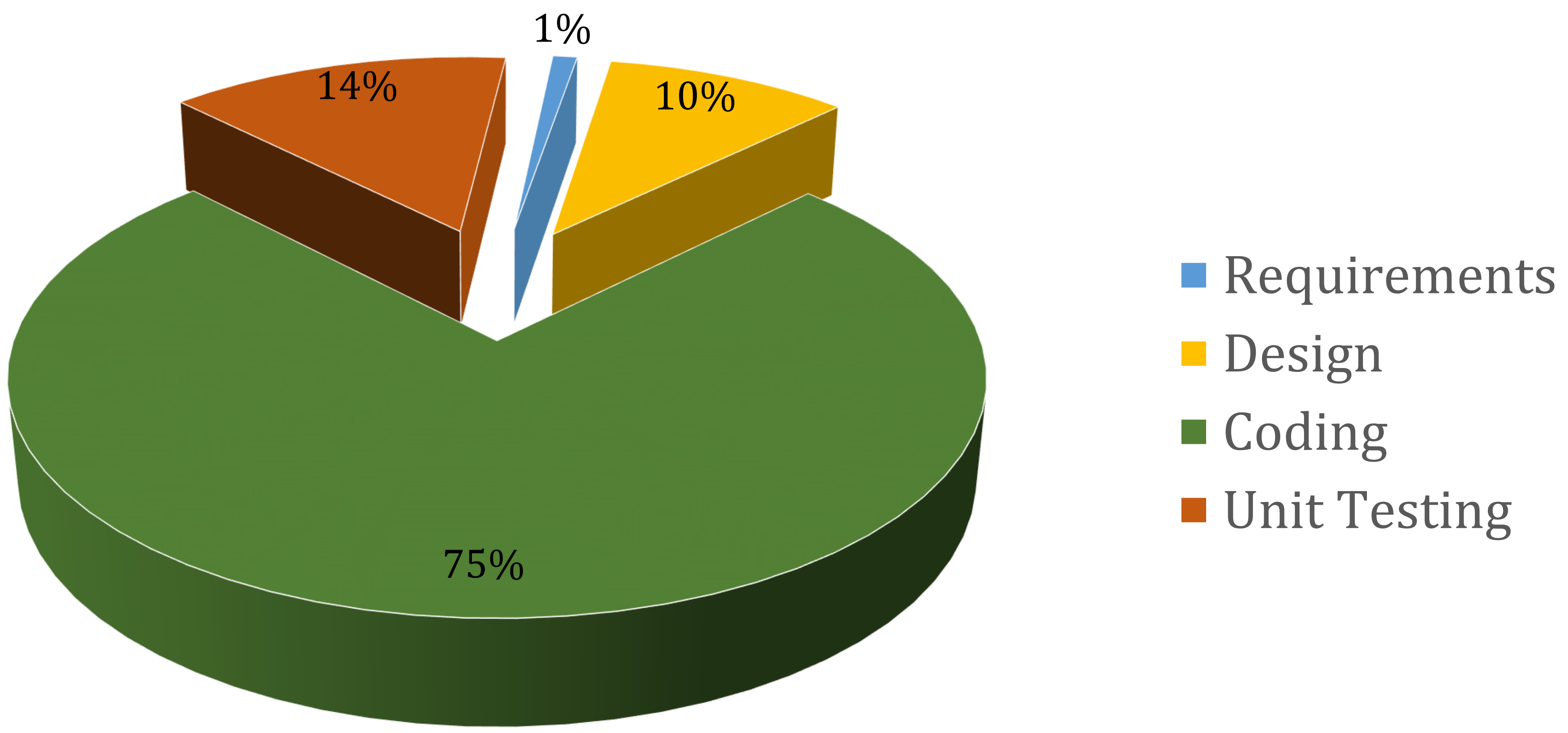
Evaluation

- Is my application doing what it is supposed to do?
- Is my application doing all that it CAN do?
- Have my customer's requirements changed/evolved?
- Can I patch my existing application, or do I need to write a new application?




Software Life-Cycle Costs
2%
5%
6%
5%
7%
8%
67%
Requirements
Specifications
Design
Coding
Unit testing
Integration
Maintenance
Source : Digital Aggregates

Academic Software Life Cycle Costs



Gathering Requirements

- Need to be expert in two things
  - Application Area – The subject of the application
  - Application Development

- Often experts in the application area are not development experts
- Often development experts are not application area experts

- Life Long Learning required!

Requirements Roles

- Developer/Designer/Architect
  - Person responsible for gathering requirements
  - Person responsible for architecture and design of application
  - Typically service provider for “customer”
- Subject Expert – Customer [representative]
  - Person responsible for providing/defining requirements
  - Person responsible for answering design questions
  - Typically, consumer of service
- Other “Stakeholders”
  - e.g. Operators, Benefactors, Regulators, IT support, Financers

Marketing Applications

- Developer must anticipate requirements
- Requirements based on a group of potential customers
- Developer must predict what most customers
  - know they want
  - want – but don’t know they want yet

Gathering Requirements

- Need to Anticipate what your customers want

- Customers often don’t know what questions to ask
    - I want an application to design a circuit.
    - How do I specify input?
    - What output do I need?
    - Where will the circuit design be used?
    - What hardware do I have available?
    - Do I need status updates?
    - Do I want status updates on my smart phone?
    - What if my competitor sees my design?

Prototypes and Models

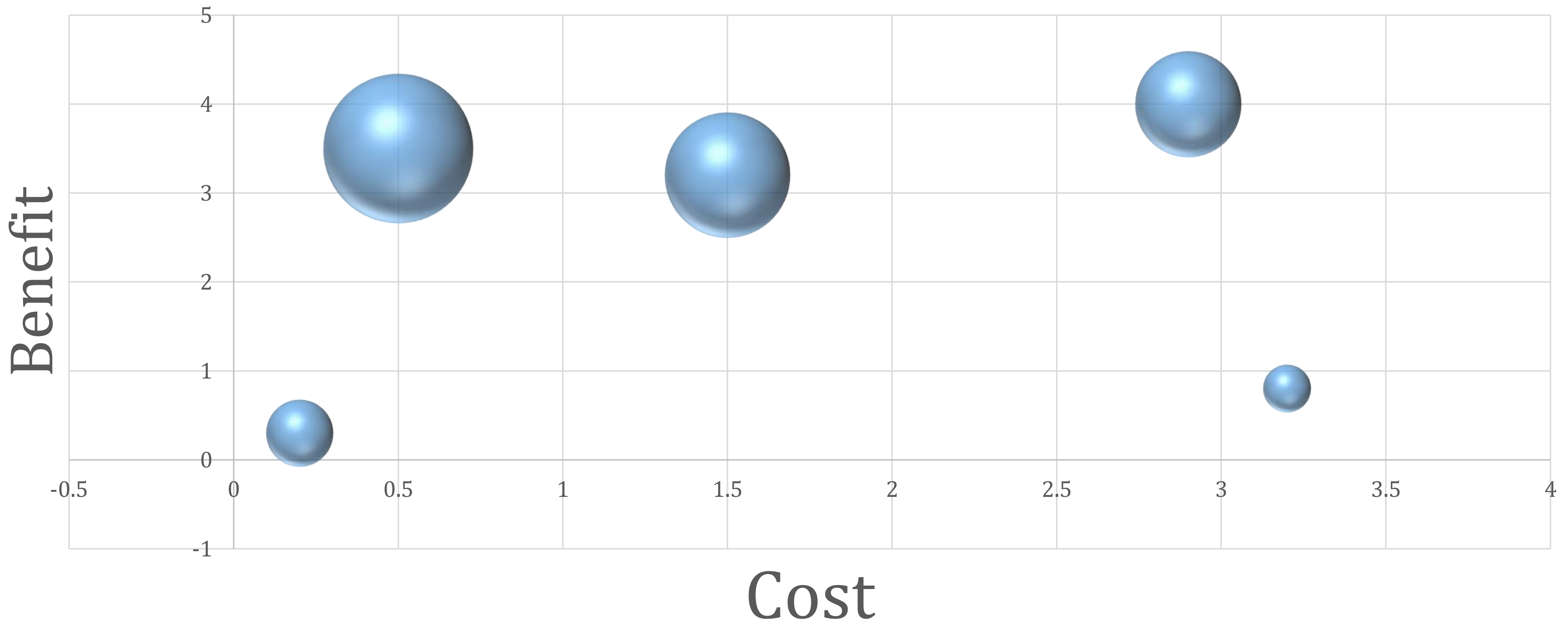
- Use/Expect prototypes and models to show look and feel of program
    - Prototype GUI
    - Modeled output
    - Scripted Implementation
- Get feedback!!!!

- Warning – if scripted prototype works too well, it may become the final product!
- Extra implementation cost buys performance, accuracy, professionalism, etc. etc.

Requirements Categories

- Input/Output Data, Data Formats
- Process
- Performance
- User Interface
- Hardware / Software / Environment
- Use Scenarios

Cost / Benefit Trade-Offs



Requirements Evolution

- Requirements evolve as
  - Customer sophistication evolves
  - Discovery during the development process
  - Hardware/Software advances
  - Environment changes

- How do we deal with changes in requirements?

Specifications

- No good formal method of capturing specifications
- For large development projects, a formal specifications document
  - English language description
  - Including illustrations
  - Including prototypes and Models
- Often agreed to and “signed”
  - “legally” binding agreement between customer and developer
  - Changes require re-negotiation of contract

Resources

- Programming in C, No references.
- Wikipedia Software Development Process https://en.wikipedia.org/wiki/Software_development_process
- Wikipedia Requirements Analysis https://en.wikipedia.org/wiki/Requirements_analysis
- Software Requirements Tutorial http://www.tutorialspoint.com/software_engineering/software_requirements.htm