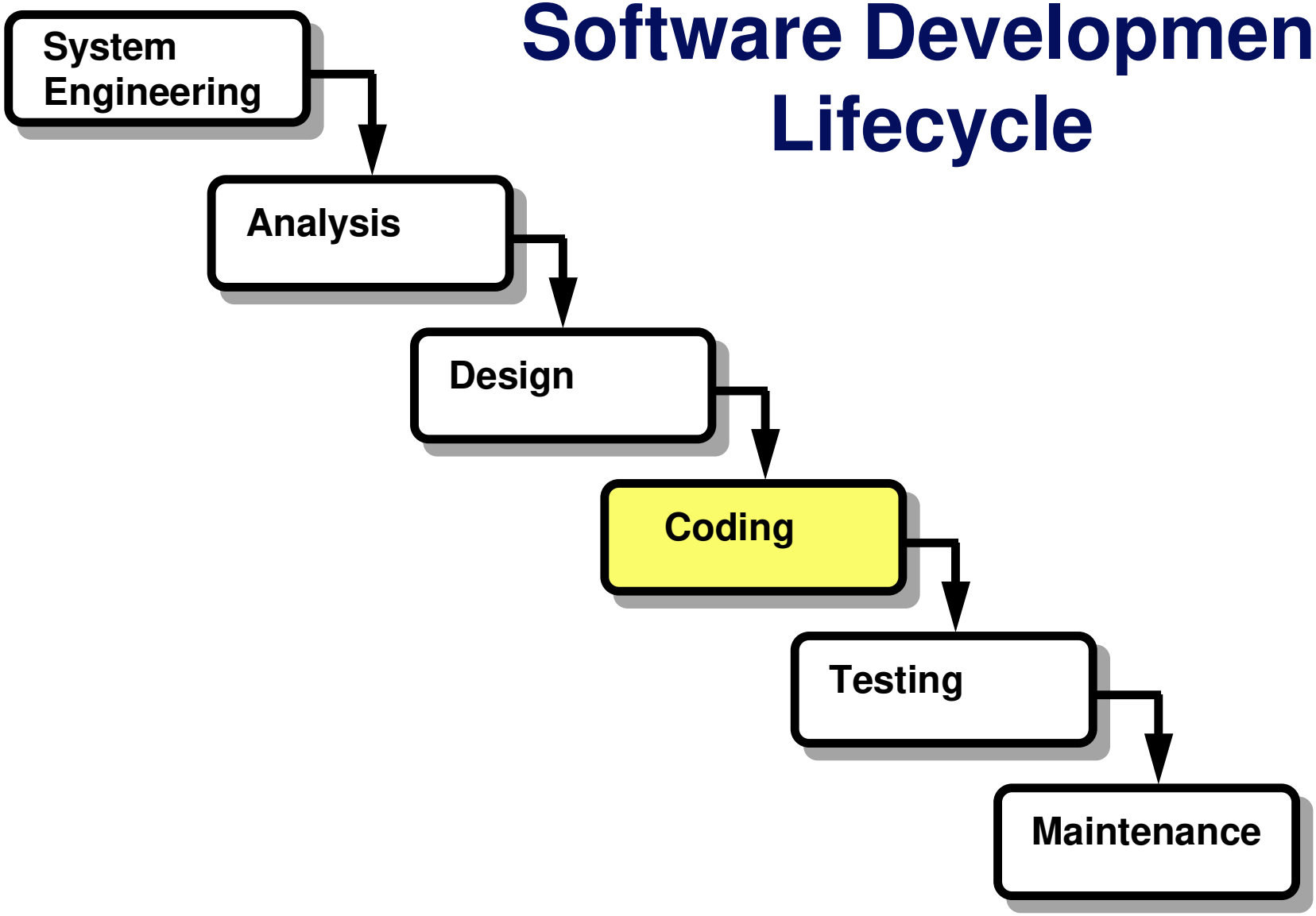
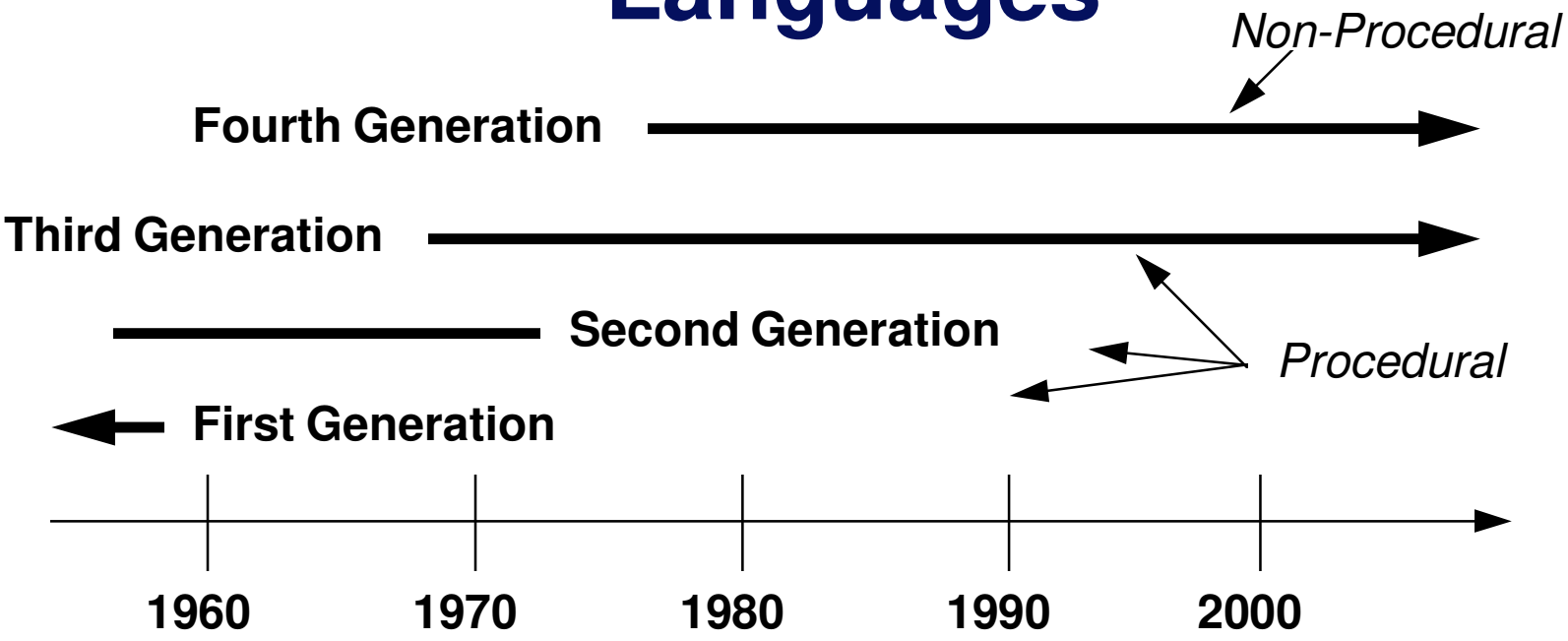
PROGRAMMING LANGUAGE ISSUES

- Procedural vs. Nonprocedural
- Goals of Software Engineering
- Language-Specific Issues
  - Control Structures
  - Data Typing
  - Subprograms and Collections
  - Structured Programming
  - Object-Oriented Programming
  - Application Domains
- Compiler-Specific Issues
- Organizational Issues
  - Culture and Psychological View
  - Education and Training, Resources Required, and Cost
- Language Selection
  - Trends by Application Domain
  - Criteria for Selection
  - Assessment

Software Development Lifecycle

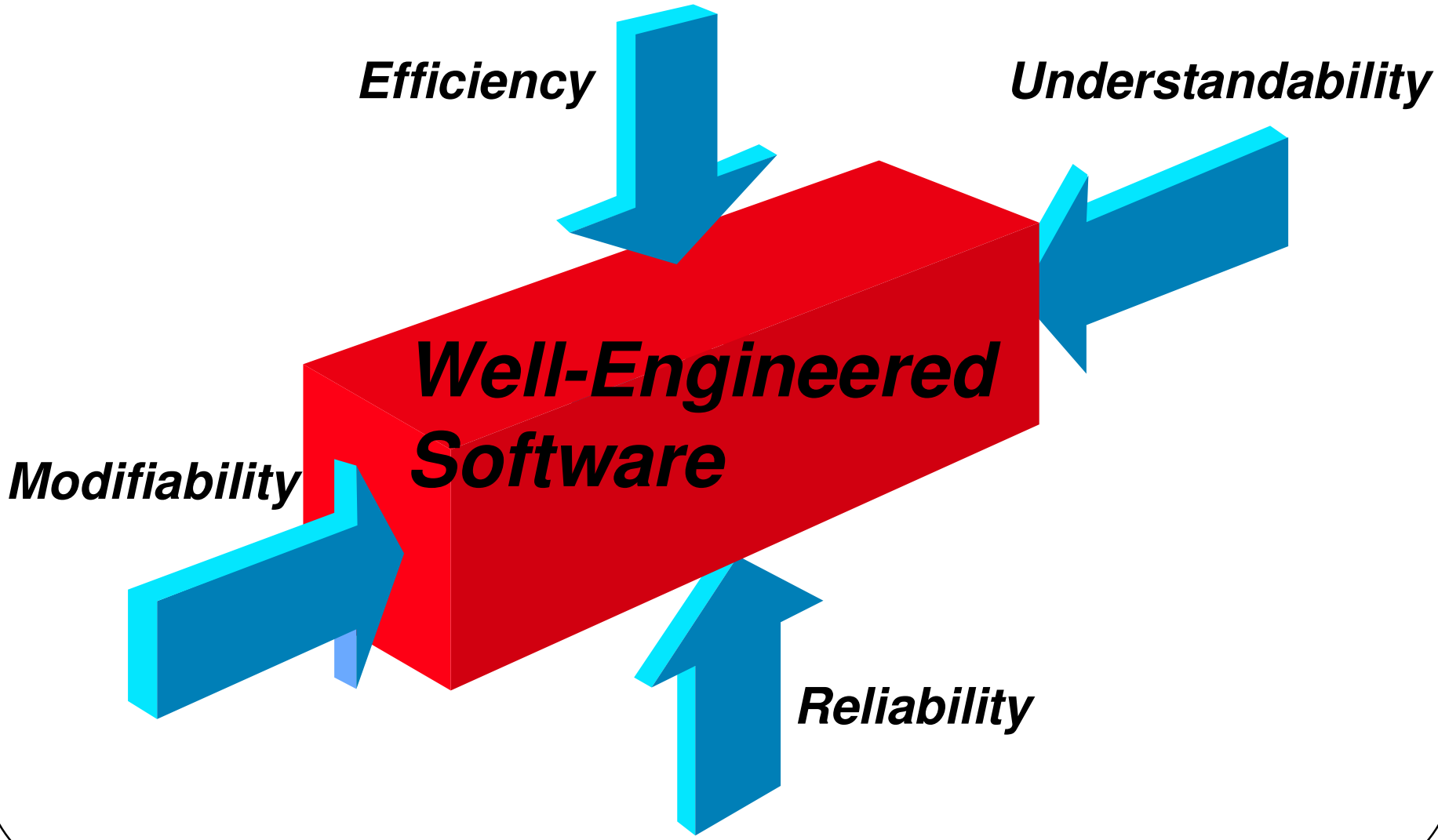


Procedural Vs. Nonprocedural Languages



- *Procedural Language* - Capable of detailing the steps to be taken to achieve desired results
- *Non-Procedural Language* - Capable of detailing the desired results (the language translator creates the steps)

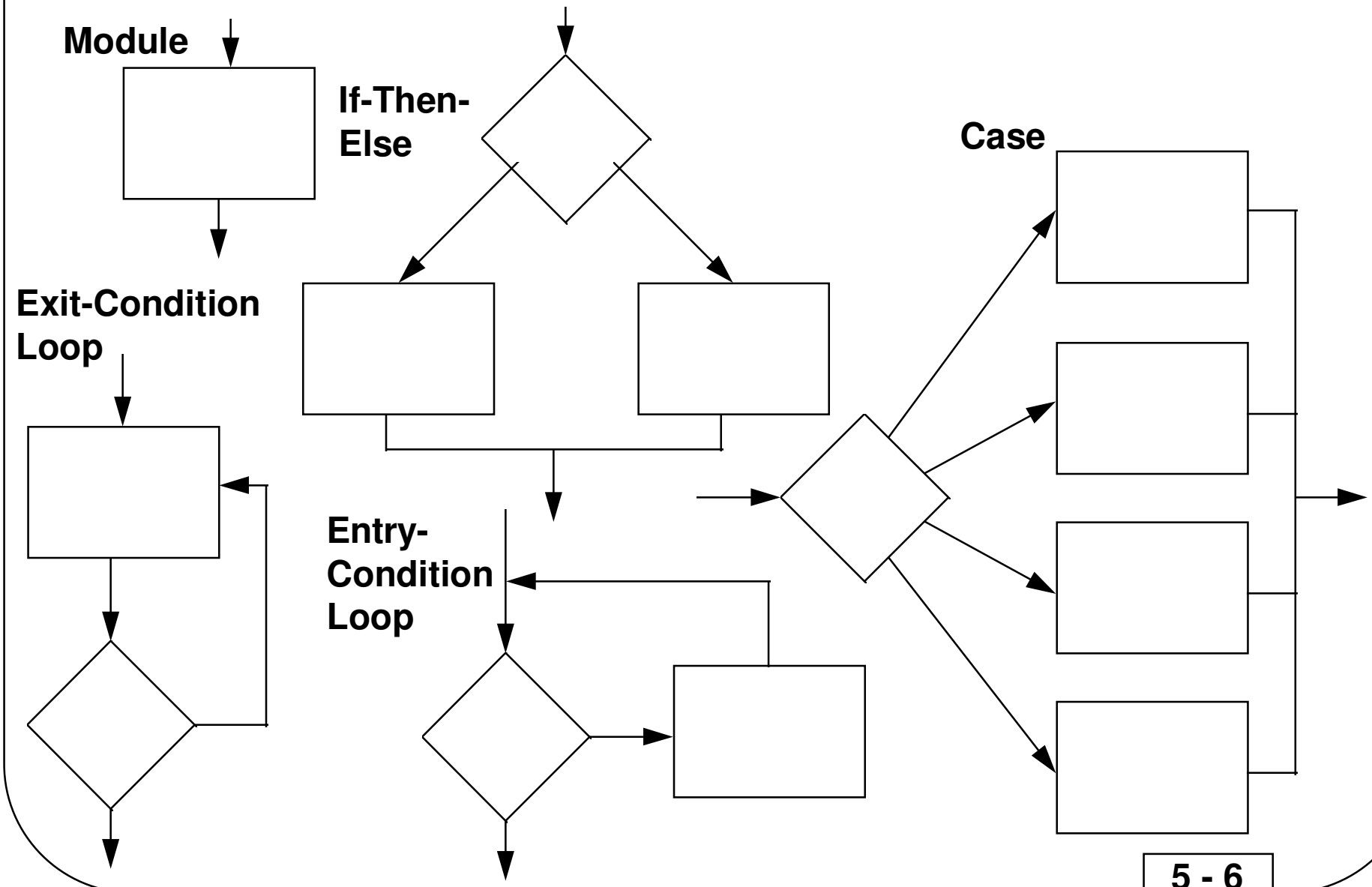
Goals of Software Engineering



Language-Specific Issues

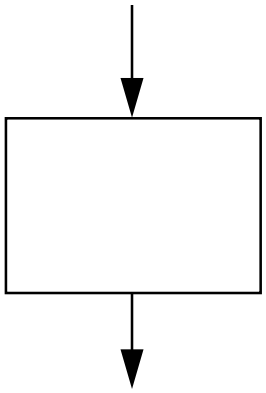
- Control Structures
- Data Typing
- Subprograms and Collections
- Structured Programming
- Object-Oriented Programming
- Application Domains

Control Structures

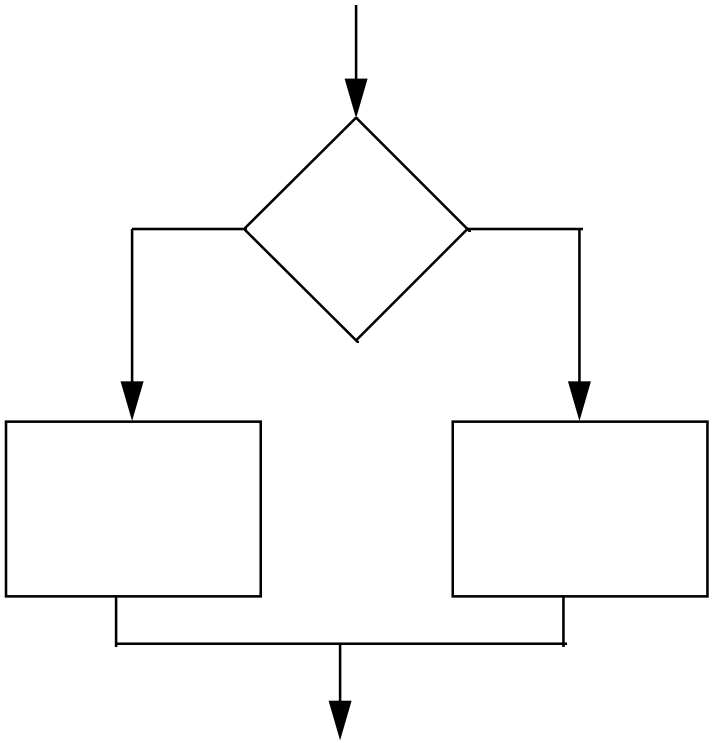


Control Structures, Continued

Module

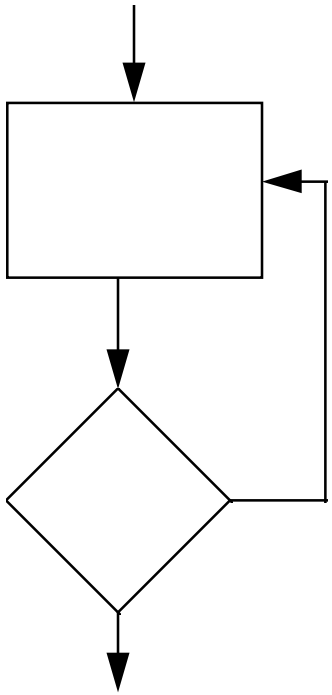


If-Then-Else

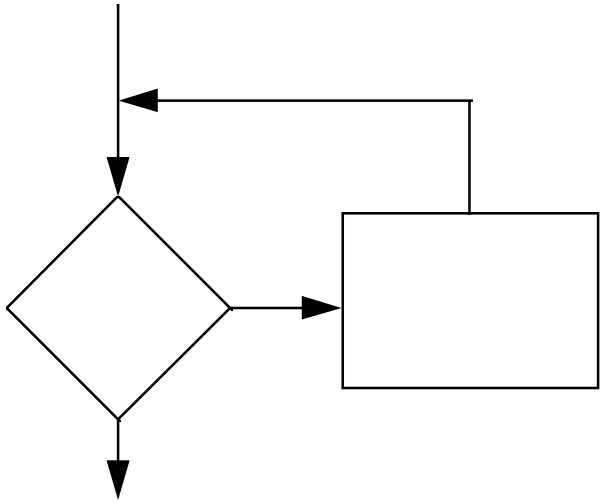


Control Structures, Continued

Exit-Condition Loop



Entry-Condition Loop



Data Typing

Scalar Types

Character/Byte

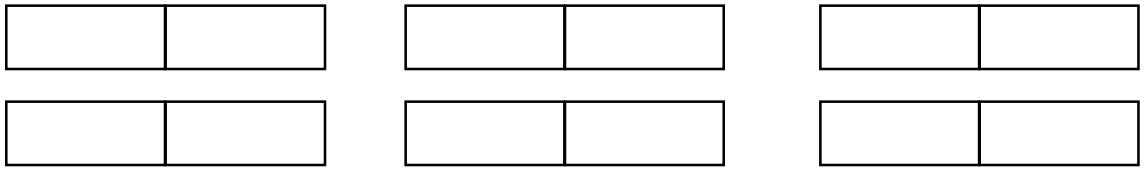
Integer

Float

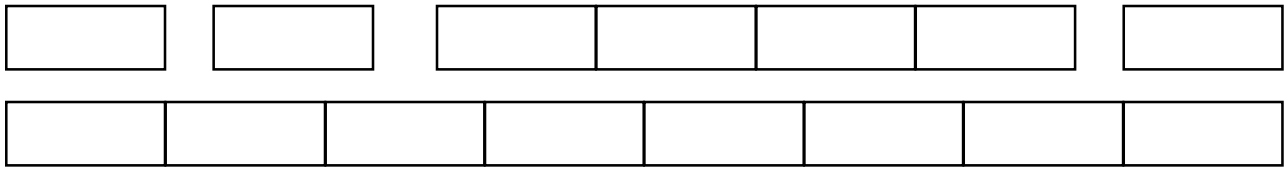
Double Float

Aggregate Types

Array



Record

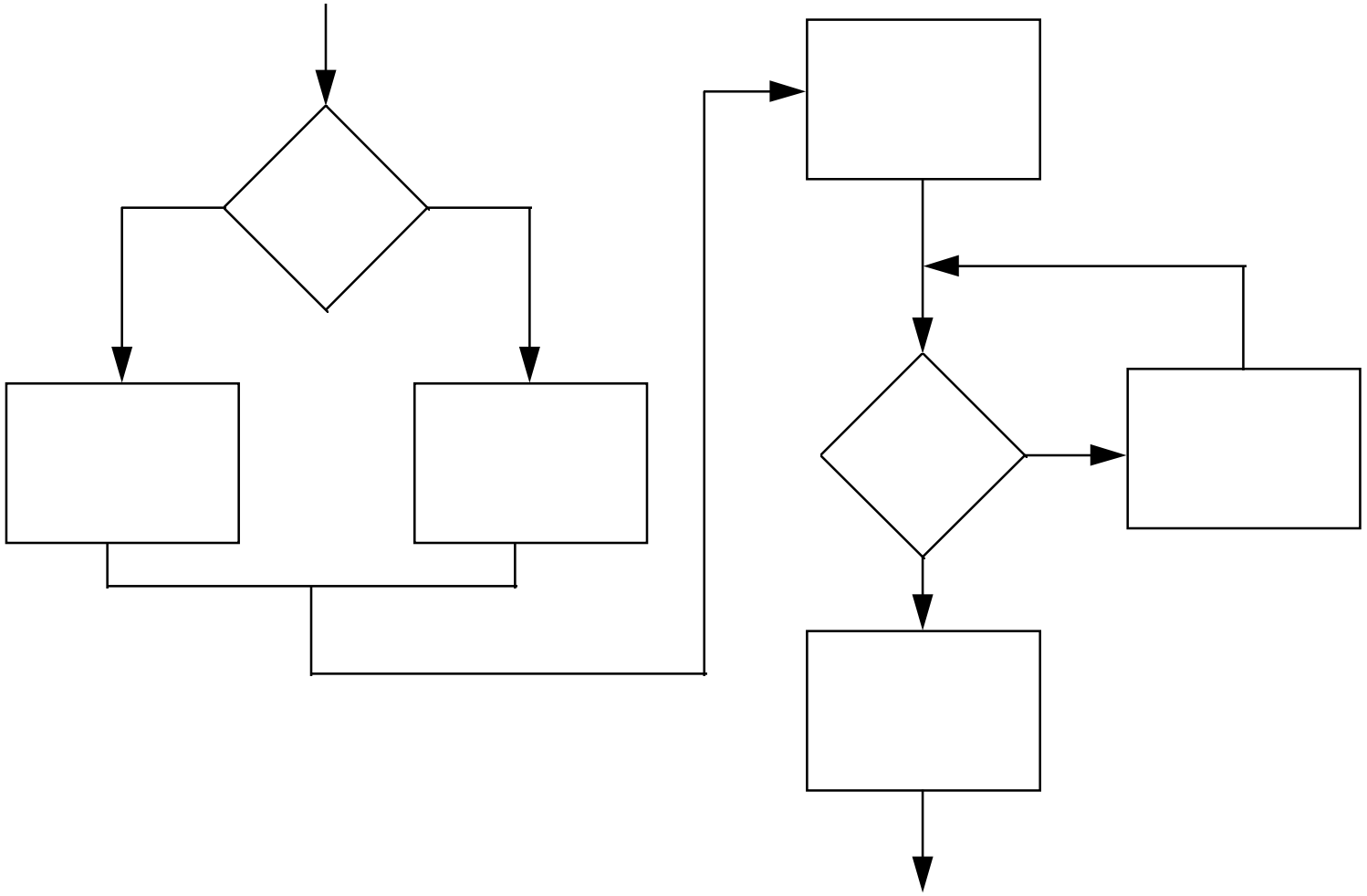


Subprograms and Collections

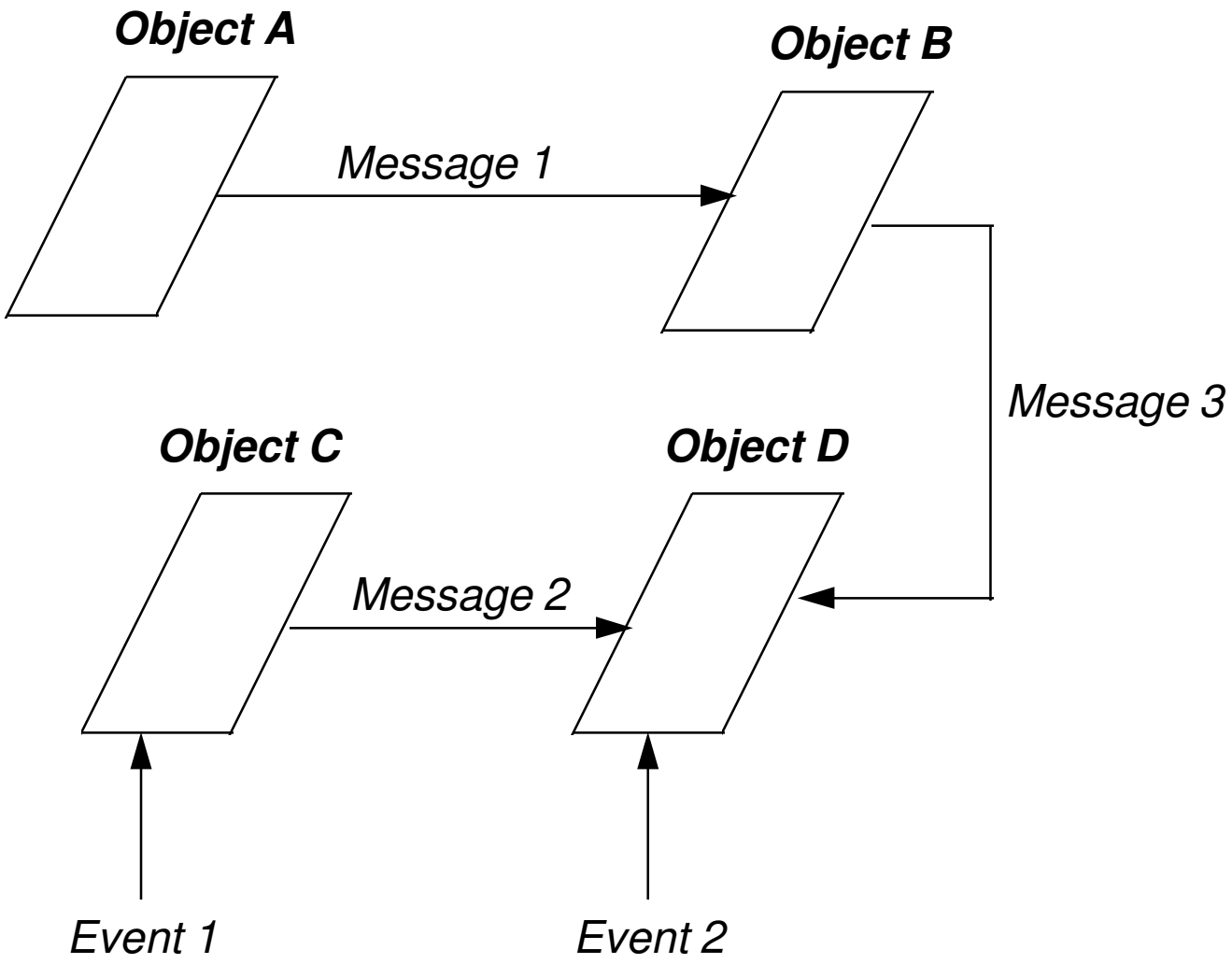
- Subprograms
  - Functions - return a specific value, like the sin of an angle
  - Procedures - perform a series of operations, returning zero or more values, like reading a line from a file

- Collections
  - Package - a group of data, subprograms, and other software constructs
  - Class - a group of data and subprograms related to a number of similar objects

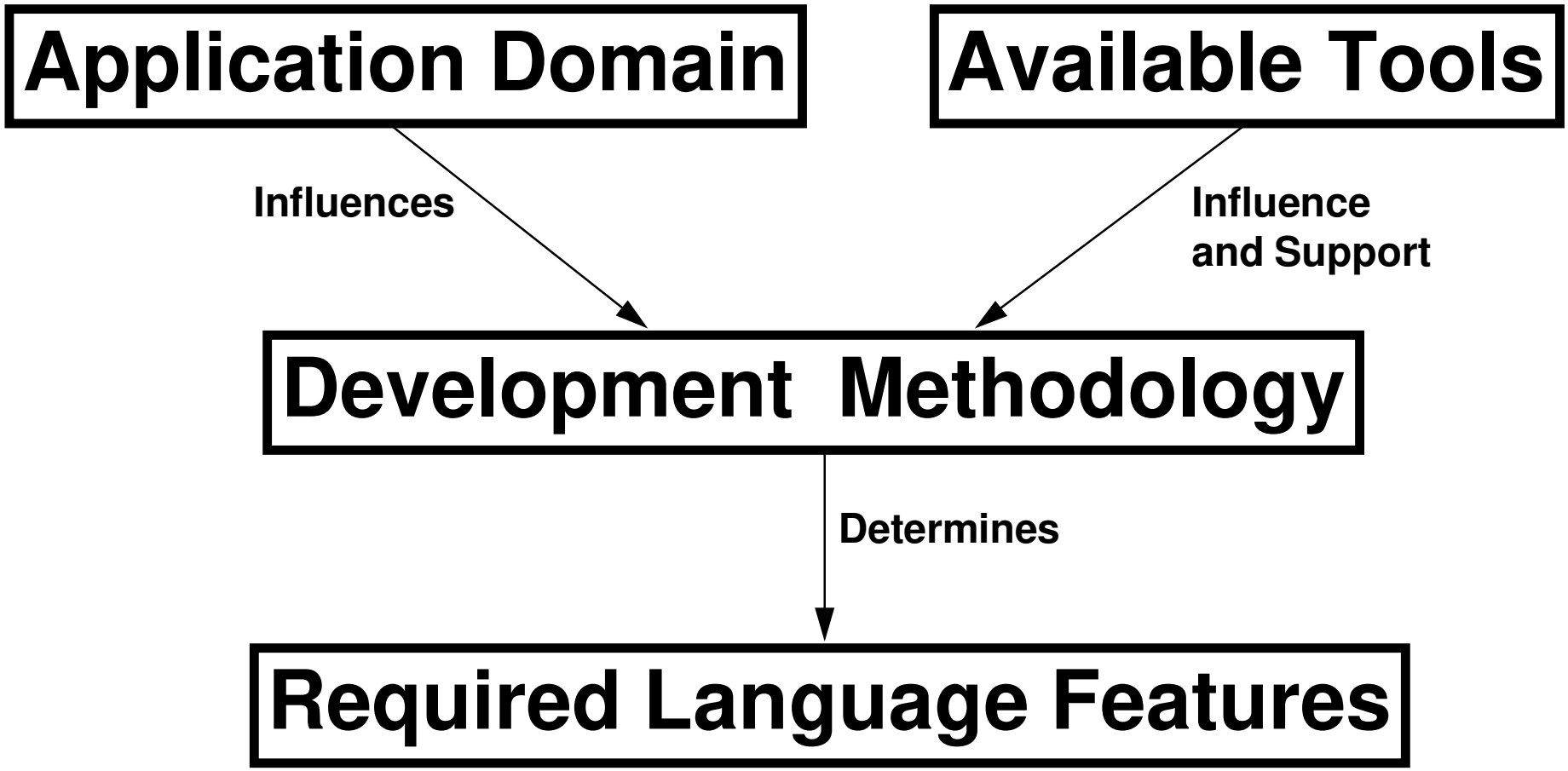
Structured Programming



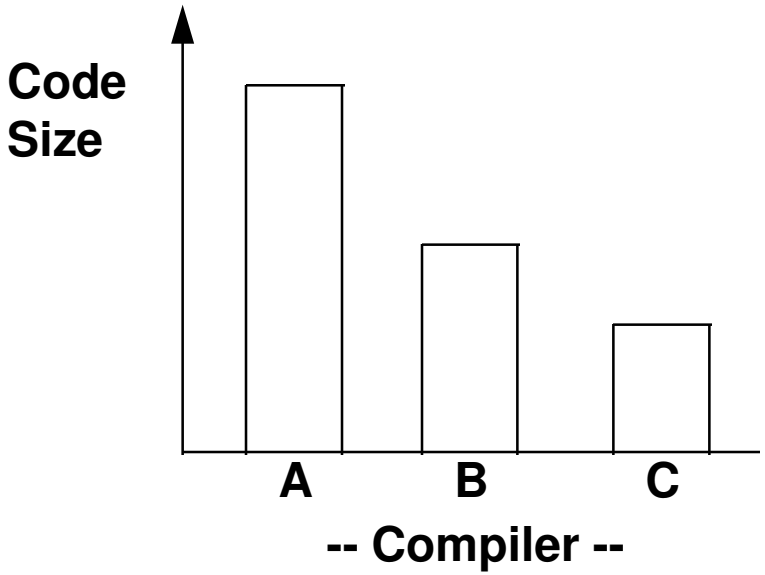
Object-Oriented Programming

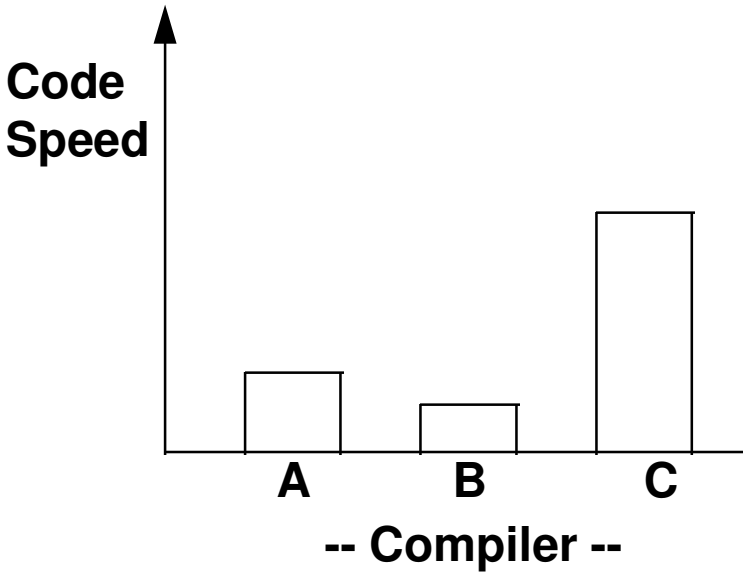


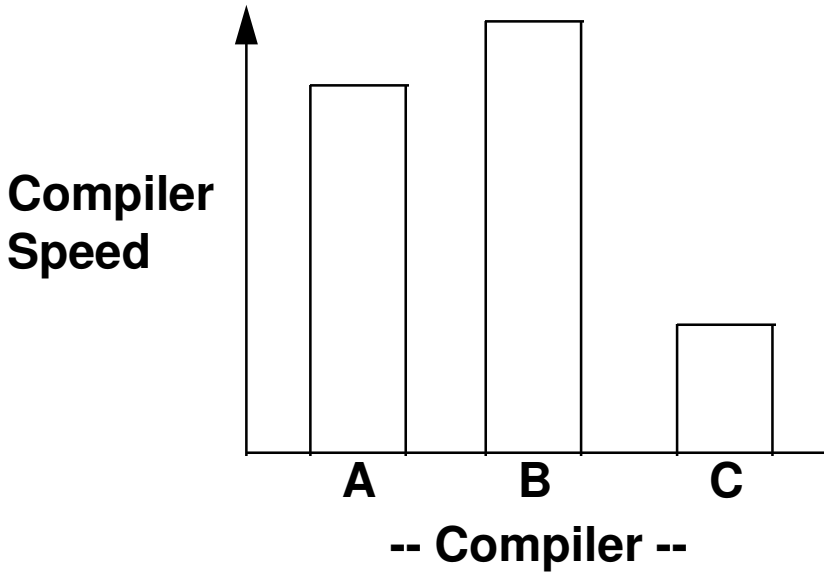
Application Domains



Compiler-Specific Issues







Organizational Issues

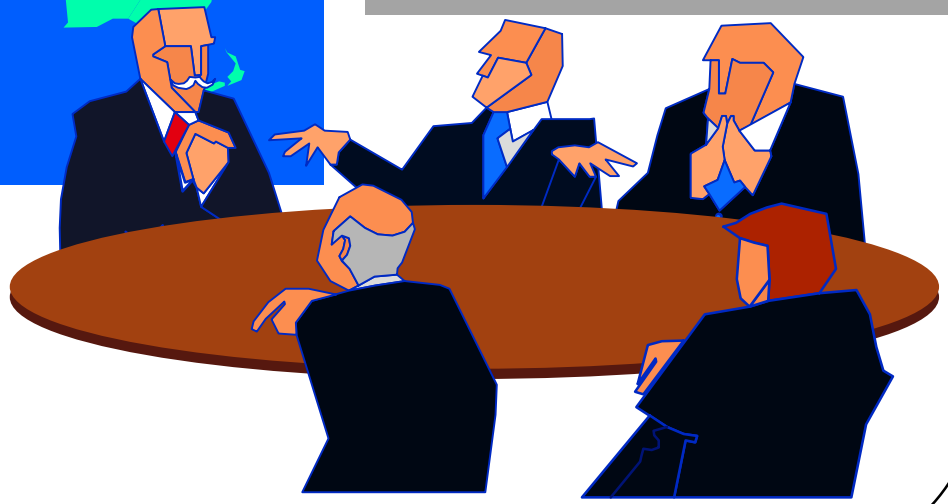
- Culture and Psychological View
- Education and Training, Resources Required, and Cost

Culture and Psychological View

- **Culture**
- **Psychological View**
- *Education & Training*
- *Resources Required*
- *Cost*

Education and Training, Resources Required, and Cost

- *Culture*
- *Psychological View*
- **Education & Training**
- **Resources Required**
- **Cost**



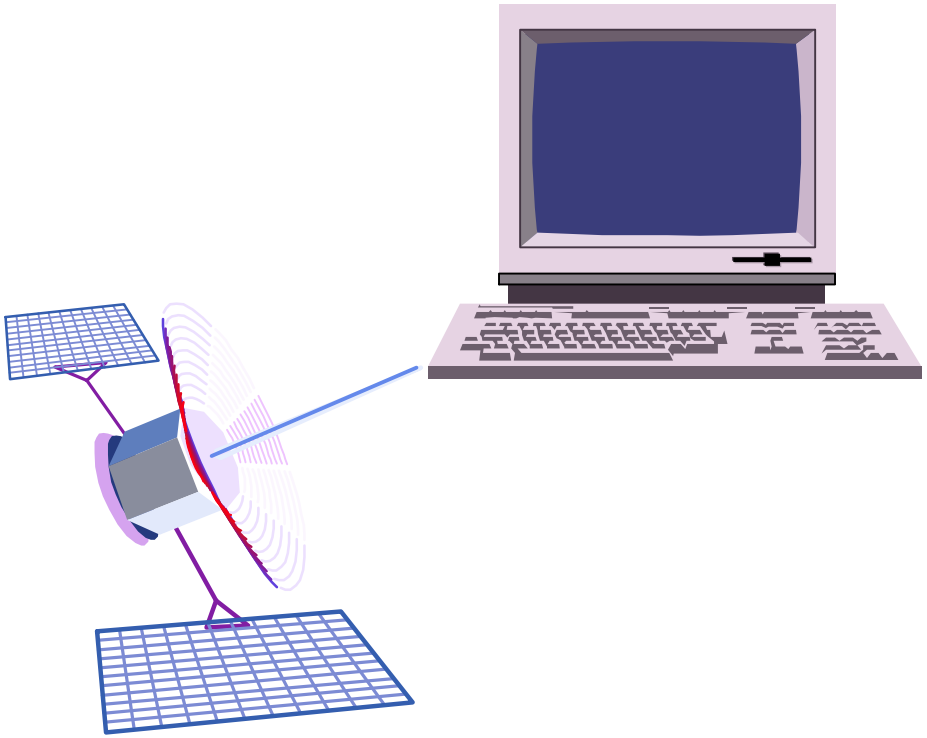
Language Selection

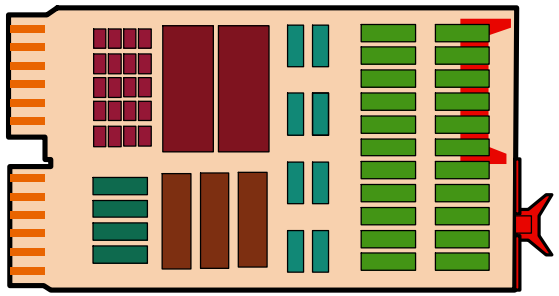
- Trends by Application Domain
- Criteria for Selection
- Assessment

Trends by Application Domain

Some Application Domains

- Systems Software
- Real-Time Software
- Embedded Software
- Business Software
- Engineering/Scientific Software
- Personal Computer Software
- Artificial Intelligence Software





Software Development Across Domains

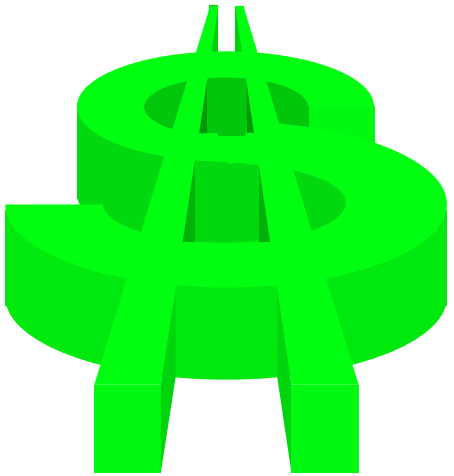
- Structured
- Object-Oriented
- Fourth Generation

Criteria for Selection

Some Criteria --

1. Application domain
2. Algorithmic and computational complexity
3. Environment in which the software will execute
4. Performance considerations
5. Data structure complexity
6. Knowledge of software development staff
7. Availability of a good compiler or cross-compiler
8. Life cycle costs of software development

Assessment

Assessing a Programming Language - Develop a Yardstick and a Buy-In

- Determine criteria for selection
- Set weights for each criterion
- Interact with your organization - get a buy-in for the above
- Select an assessment team from various representative groups in your organization
- Perform the assessment analytically
- Brief organization on the results of the assessment and discuss - get a buy-in for the fairness of the assessment
- Reassess if necessary
- Select language and brief the organization