

PROGRAM DEVELOPMENT

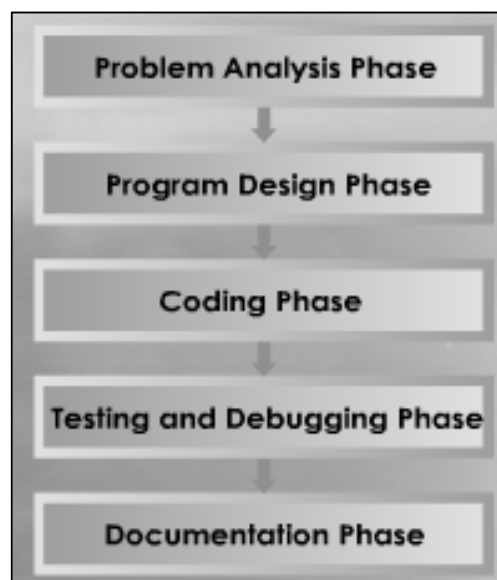
LESSON 13

OVERVIEW OF PROGRAM DEVELOPMENT PHASES

In program development, there are five main phases. These phases are a series of steps that programmers undertake to build computer programs. The program development phases guide computer programmers through the development of a program.



The five main phases of program development are as follows:



PROBLEM ANALYSIS PHASE

During the problem analysis phase, the programmer will interview the client to find out what the client's needs are.

For example, the client might be a school that wishes to set up a school registration program. So the school administrator might tell the programmer that they need to record students' data such as name, date of birth, gender, class, parents' names, address and contact numbers.

PROGRAM DESIGN PHASE

Based on that, the programmer will design a flow chart that represents the needs of the client, which in this case is the school registration program.

CODING PHASE

Once the flow chart is confirmed, the programmer will perform coding.

TESTING AND DEBUGGING PHASE

The school registration program will be tested by the users at the client's site. In this case, it will be the school office administrators. If there are any errors, the programmer will do a debugging of the program.

DOCUMENTATION PHASE

After this, the programmer will complete the documentation for the program; this includes the user manual, a clear layout of the input and output records and a program listing.

EXT : SIX STEPS OF SOFTWARE DEVELOPMENT

Step 1

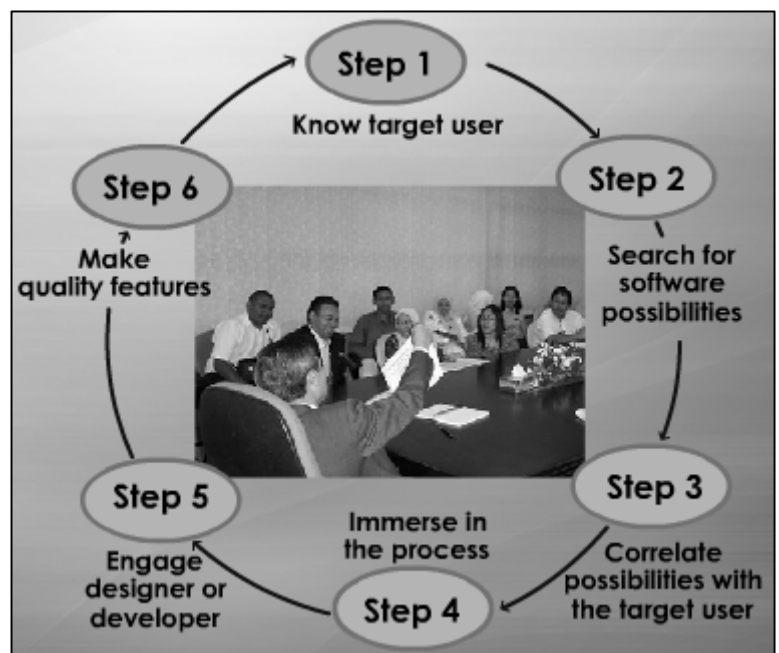
Know your target user.

The software we develop is for our user. Learn their preferences.

Step 2

Search for the exciting possibilities in your software.

In this way, it is possible to identify their likely concerns and anxieties and thus take them into account during the design stage.



Step 3

Correlate these possibilities with the target user. Find how to combine these possibilities with user personalities.

Step 4

Immerse yourself in the process. You have to be involved deeply in the subject that you develop.

Step 5

Engage a talented and visionary designer or developer in the team. They are responsible for all aspects of the software.

Step 6

Make quality and fantastic features as the priorities among software development team members. The software should deliver the complete, accurate, reliable and available information to the right person at the right time in a suitable format.

LESSON 14

PROBLEM ANALYSIS

PROGRAM DESIGN

The first step in the program development phase is to analyse the problems faced by target users. In this phase, a programmer reviews and defines the problems. Identifies the data input, process and output for the program.

CASE STUDY

The school needs a school registration program to computerise the registration of new students.

Any new student who enrolls in the school should have all his or her data keyed into the school registration program. They will notified of his or her class for the coming academic year or term.

This case study will be used throughout the program development phases.

In this case study, the programmer reviews and defines the problems faced by the school administrators.

the problem

Increase of students make the registration more and more difficult.

The school enrolment has increased so much that it has become very difficult for them to perform student registration without the help of a computer program or system.

the solution

Registration must be made by using the computer.

The programmer must indicate the purpose of the program before continuing to the next task.

the purpose

Purpose of the school registration program is to computerise the registration of new students.

In this case, the purpose of the school registration program is to computerise the registration of new students.

In this situation, the programmer identifies the data input, process and output for the program.

First step: The programmer identifies the data input, for example student's name, student's NRIC, gender, telephone number, date of birth, parents' name and address.

Second step: The programmer identifies the process for the program. Any new student who enrolls in the school should have all his or her data keyed into the school's registration program.

Input	Process	Output
Request Student's Name Request Student's NRIC Request Student's Gender Request Phone Number Request Student's Date of Birth Request Parent's Name Request Student's Address	Verify students' data	Student's Class

PROBLEMS AND SOLUTIONS

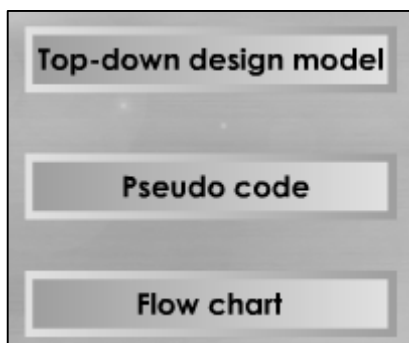
In program development, the target user and programmers will face some problems. Here are some common problems faced by them, and solutions to overcome them.

Problems	Solutions
<ul style="list-style-type: none"> • users don't understand what they want 	<ul style="list-style-type: none"> • programmers use whiteboards to sketch data flows of the user or client's system
<ul style="list-style-type: none"> • users won't commit to a set of written requirements 	<ul style="list-style-type: none"> • programmers must ensure that they get the client's signature of approval for the program requirements
<ul style="list-style-type: none"> • users insist on new requirements after the cost and schedule have been fixed 	<ul style="list-style-type: none"> • programmers must clearly explain that they will charge extra costs for any requirements not previously specified by users
<ul style="list-style-type: none"> • communication with users are slow 	<ul style="list-style-type: none"> • programmers must constantly interact with the user or client
<ul style="list-style-type: none"> • users often do not participate in reviews or are incapable of doing so 	<ul style="list-style-type: none"> • programmers should show users some sample programs (prototyping)

LESSON 15 PROGRAM DESIGN

Many inventions today are driven by computer programs. To develop good programs, program design is a very important phase.

PROGRAM DESIGN PHASE



In program design, there are three popular tools used, namely the top-down design model, pseudo code and flow chart.

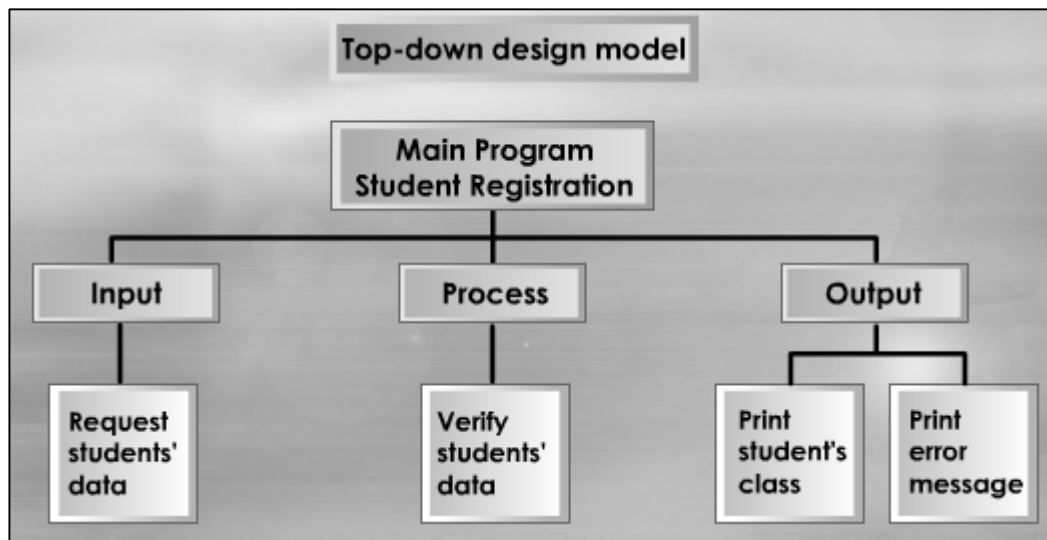
Case Study

The school needs a school registration program to computerise the registration of new students.

Any new student who enrolls in the school should have all his or her data keyed into the school registration program. They will notified of his or her class for the coming academic year or term.

This case study will be used throughout the program development phases.

In this case study, the programmer generates a top-down design model.



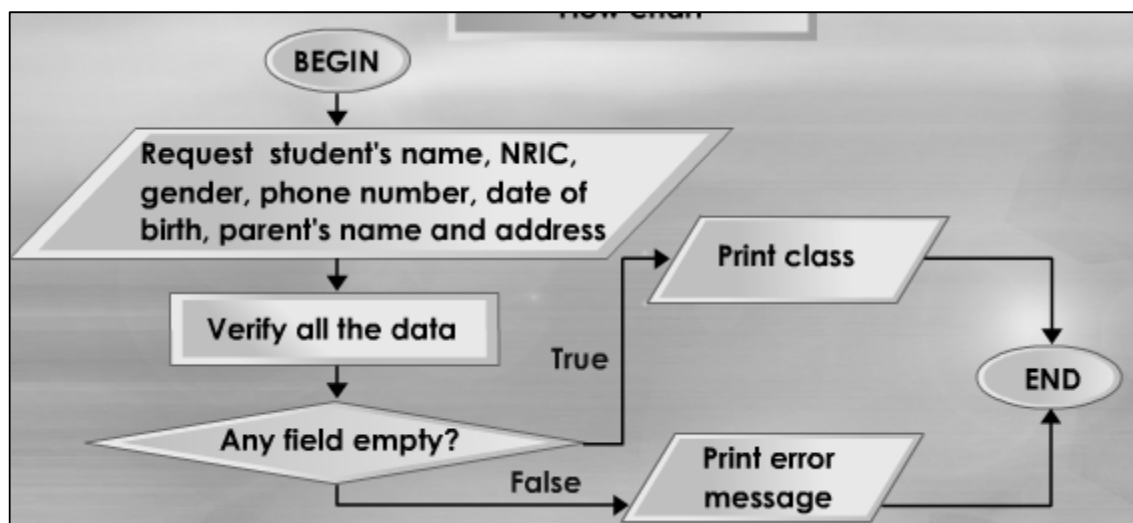
This top-down model consists of three modules, namely input module, process module and output module.

Then the programmer writes the pseudo code for the program based on the top-down design model.

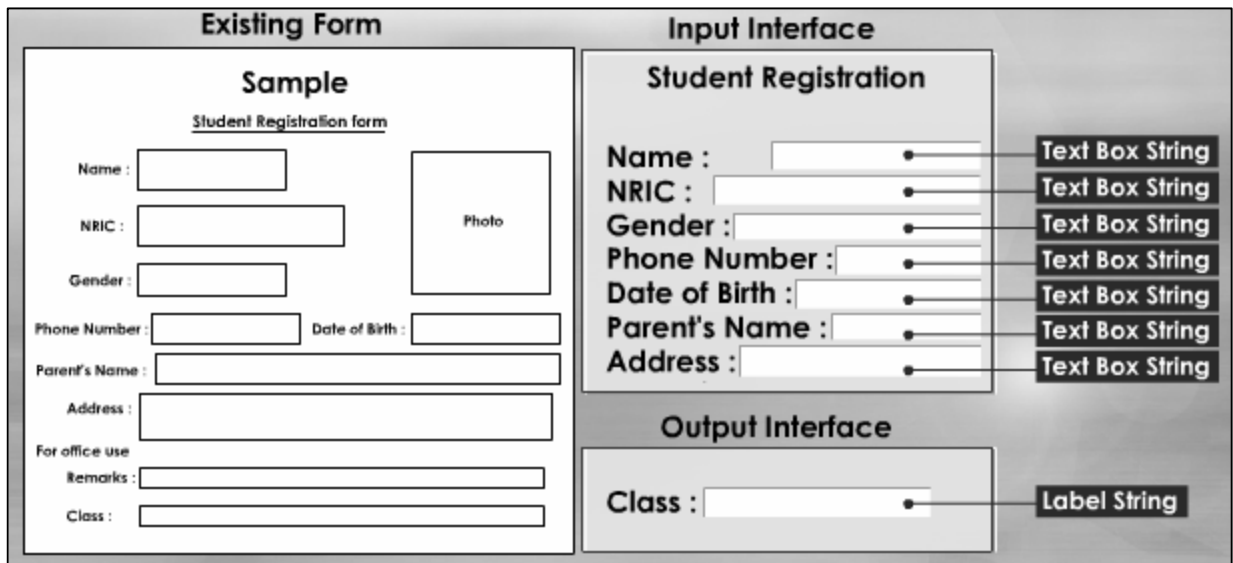
```
Pseudo code

BEGIN
key in students' data
  If all fields filled then
    print class
  Else
    print error message
  End If
END
```

Next, the programmer draws the flow chart that shows the data flow of the program.



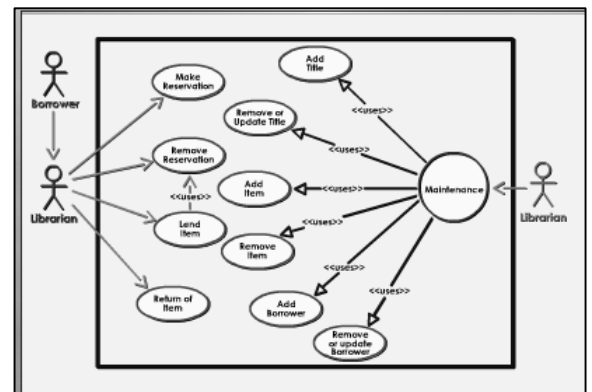
Besides flow chart, a programmer also produces input and output user interfaces base on the existing form.



EXT : UNIFIED MODELING LANGUAGE

Unified Modeling Language (UML) has been adopted as a standard notation for object modeling and development.

These notations are used in diagrams that present various views of the program being developed.



These are some symbols used in Unified Modeling Language Diagrams.

Some Symbols Used In the UML Diagrams	
Interface	
Actor	
Use Case	
Dependency	
Generalization	

LESSON 16

CODING

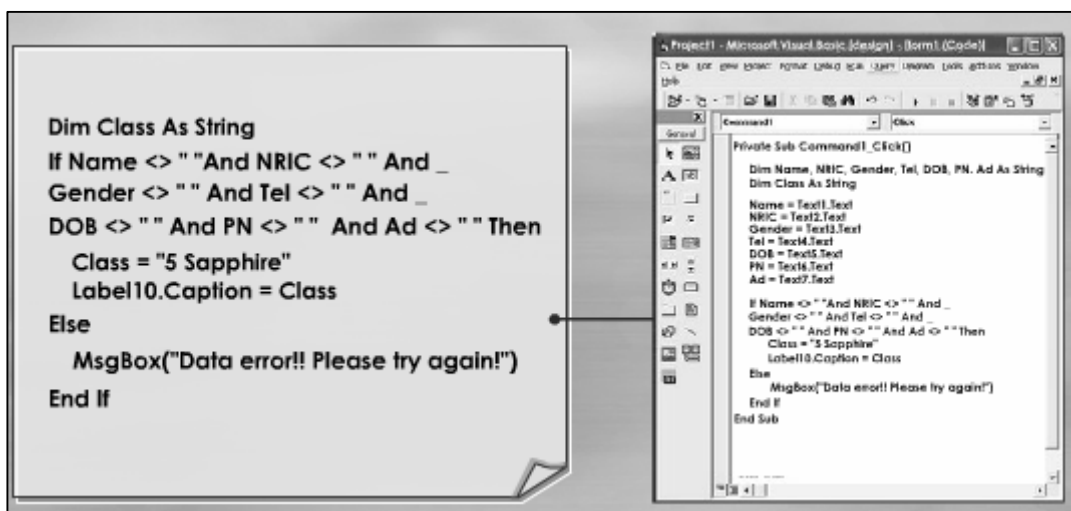
The process of writing instructions or code for computers is known as coding. Hence without coding, there would be no software to help us perform useful tasks on computers.

CODING

In this phase, a programmer uses a program development tool which generates or provides some or all codes.



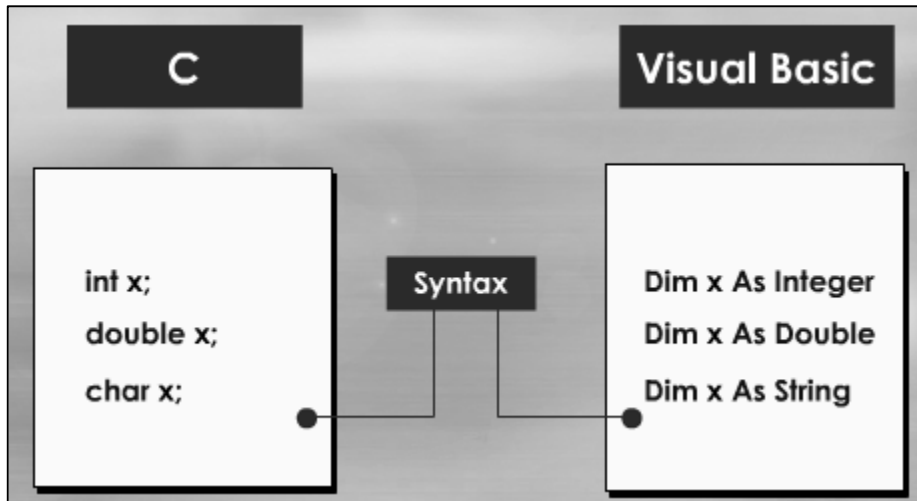
Coding is the process of writing the solution using the computer programming language. After finishing the coding process, the programmer will type the programming language code into the computer.



PROGRAMMING LANGUAGE

There are many different programming languages in the market. Examples of the popular programming languages used in Malaysian secondary schools are Visual Basic and C language.

Each of these programming languages has its own particular syntax.



CASE STUDY

Student Registration

Name :

NRIC :

Gender : Tel :

Date of Birth :

Parent's Name :

Address :

Student's Class :

```
Private Sub Command1_Click()  
    Dim Name, NRIC, Gender, Tel, DOB, PN, Ad As String  
    Dim Class As String  
  
    Name = Text1.Text  
    NRIC = Text2.Text  
    Gender = Text3.Text  
    Tel = Text4.Text  
    DOB = Text5.Text  
    PN = Text6.Text  
    Ad = Text7.Text  
  
    If Name <> "" And NRIC <> "" And _  
        Gender <> "" And Tel <> "" And _  
        DOB <> "" And PN <> "" And Ad <> "" Then  
        Class = "S Sapphire"  
        Label10.Caption = Class  
    Else  
        MsgBox("Data error!! Please try again!")  
    End If  
End Sub
```

EXT : EXTREME PROGRAMMING

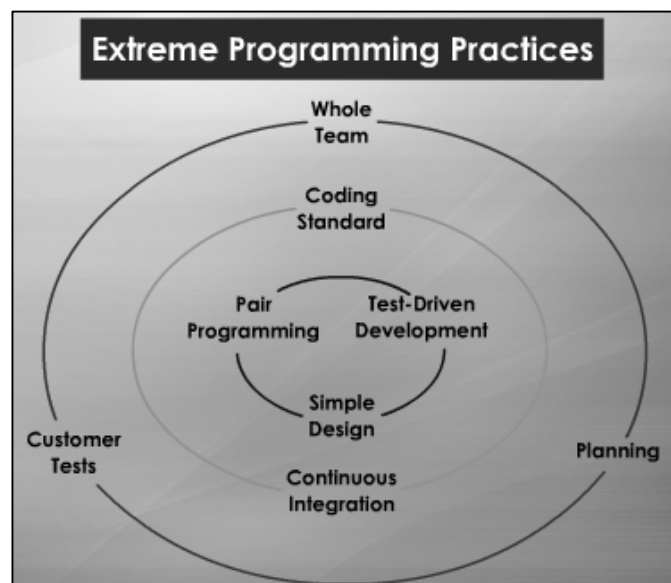
Extreme programming is a strategy that proposes that a programmer should immediately begin coding and testing solution as soon as requirements are defined. The code is continually tested and refined until it works.



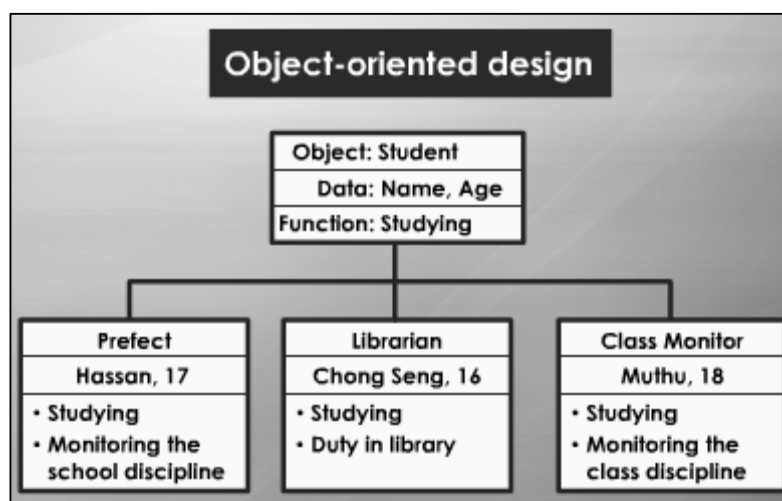
Extreme programming also suggests that programmers work in pairs.

They communicate with each other to generate ideas for proper solutions.

IT experts claim that extreme programming reduces the time required for the program development phases.



Extreme programming most often is used in object-oriented design.



LESSON 17

TESTING AND DEBUGGING

For computers to perform their tasks smoothly, the software or program must be error-free.

Imagine doing an important assignment on the computer. Suddenly, there is a program error and you are unable to complete your work and meet the deadline.



That is why before any software is released to the market or given to the users, it must undergo testing and debugging. Program testing is done right after coding. The purpose of program testing is to ensure the program runs correctly without any syntax or logic errors.

If errors are uncovered during testing, the programmer will proceed to debugging. Debugging involves tracing the source of errors in the program and making the necessary corrections.

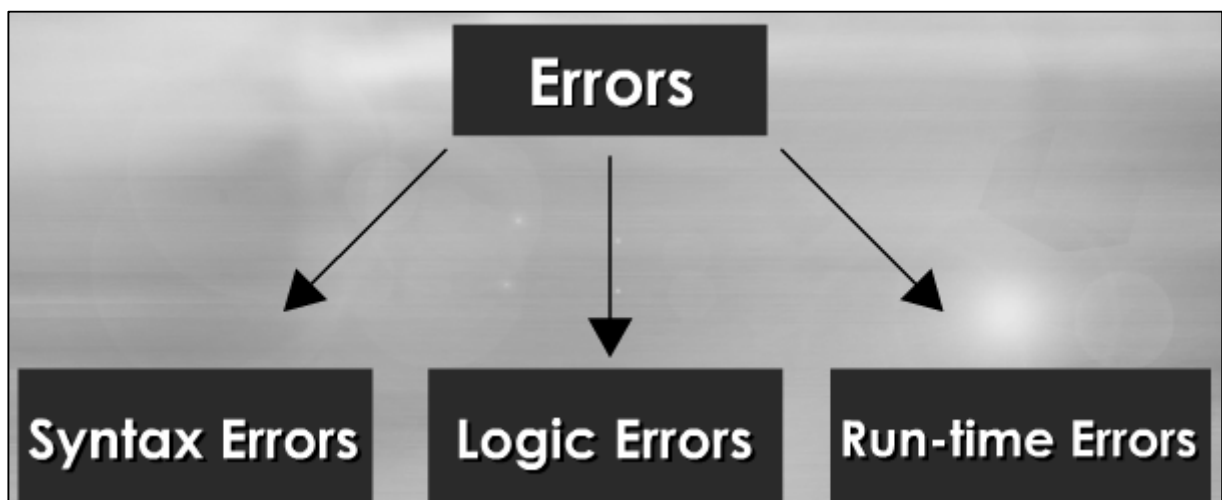
After correcting the errors, it is normal for programmers to test run the program again just to make sure that the errors have been properly fixed.

TESTING AND DEBUGGING

Once the programmer has finished the coding, the next step is to test it.

The purpose of program testing is to ensure the program runs correctly and is error-free.

There are three types of errors uncovered during this phase: syntax errors, logic errors and run-time errors.

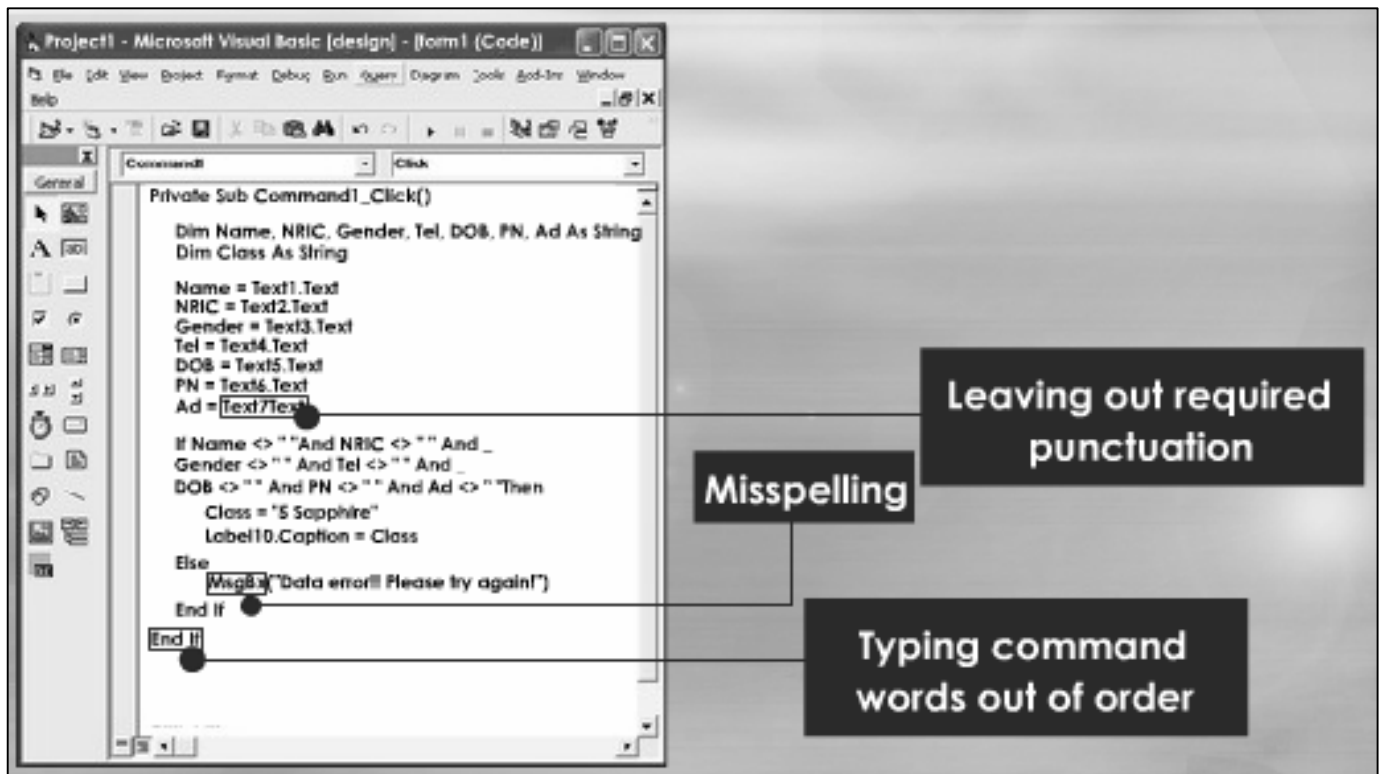


SYNTAX ERROR

When the code violates the syntax of the programming language, a syntax error occurs.

A syntax error is caused by a wrong spelling in command and declaration. Other syntax errors include case sensitive, punctuation and wrong word command.

They either show up as you type the program code, or if you have turned off the automatic syntax error check, the syntax errors show up when you try to run or compile the program.



When syntax error is located, a message is displayed on the screen.

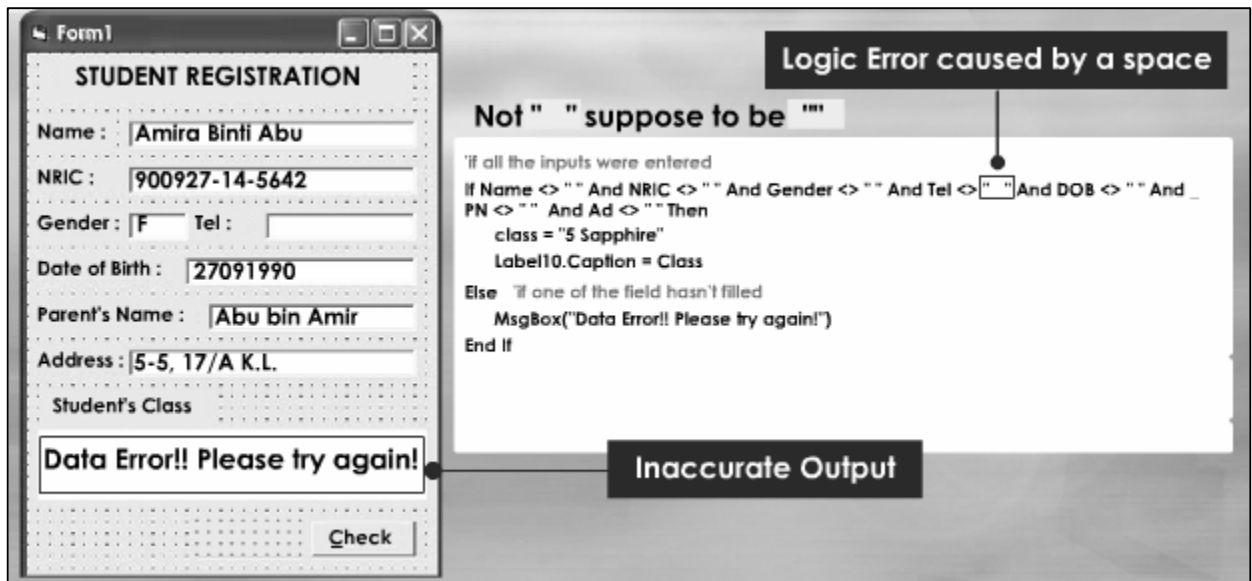


The programmer must review and correct all syntax errors.

LOGIC ERROR

If the expected output and actual output do not match for any set of data, the program has a logic error.

A logic error is an error in the design that causes inaccurate outputs.



We can use desk check technique to test logic errors. There are 3 steps to perform desk checking.

First, create a set of test data that includes input and output data.

Second, use the test data to test the coding and record the result.

Lastly, compare the manual results with the computer generated results.

Desk Checking

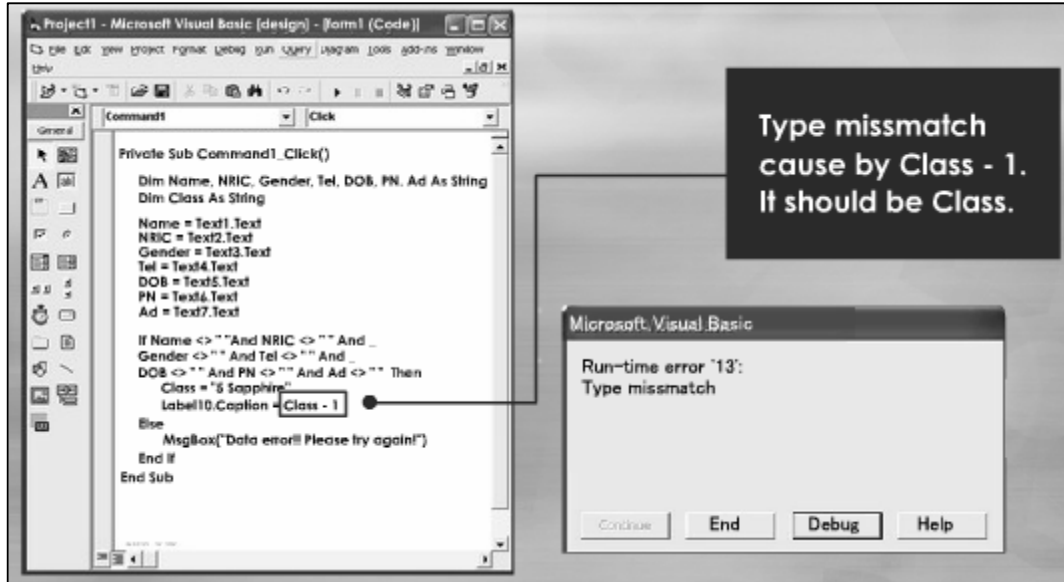
Compare

Name	Data Input						Manually Output	Computer Generated Output
	NRIC	Gender	Tel	DOB	PN	Ad	Class	Class
All bin Ahmad	901129-14-6639	M	(space)	11051990	Ahmad Razak	5-5, 17/A K.L.	5 Sapphire	"Data Error!! Please try again!"
Amira binti Abu	900927-14-5642	F	0362545632	03051990	Abu Amir	8-B, 54/B K.L.	5 Sapphire	5 Sapphire
Kelvin Lee	901013-14-1882	M	0362515269	27101990	Lee Tien Fatt	6-D, 50/C K.L.	5 Sapphire	5 Sapphire
Zhang Xian Zhi	900213-14-1467	F	0362584562	11051990	Zhang Fei	4, Jln SD1/D, KI	5 Sapphire	5 5Sapphire

RUN-TIME ERROR

Run-time error is an error that occurs while the program is running or executing.

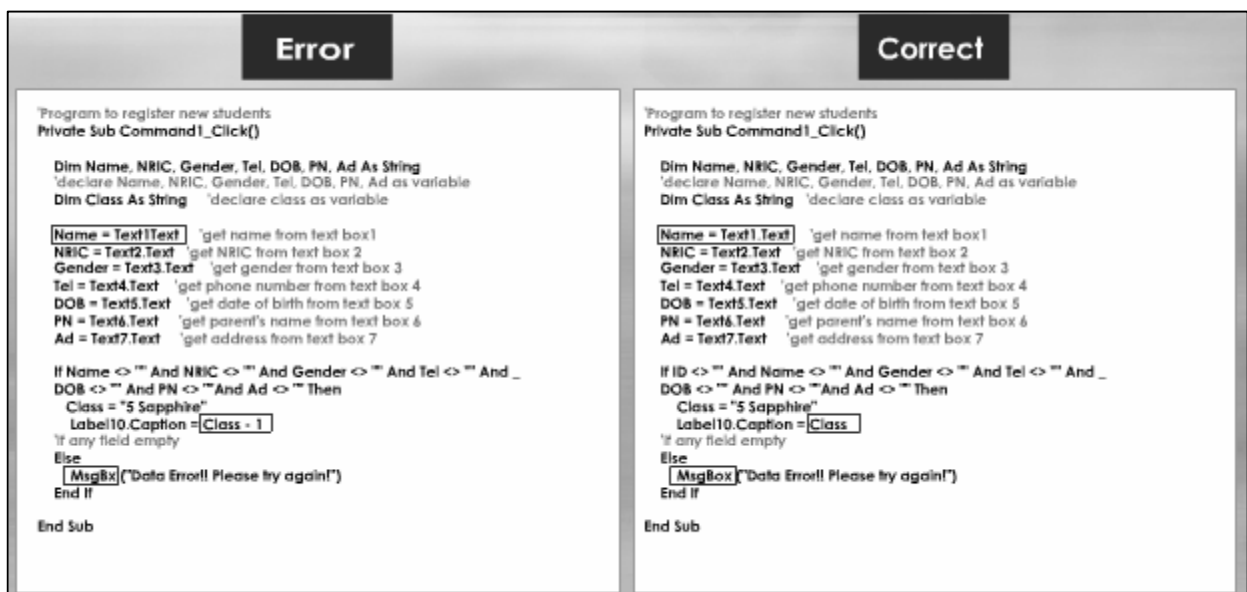
A run-time error may cause the program to stop running.



DEBUGGING

The process of locating and correcting of syntax and logic errors in a program is known as debugging the program.

The program errors themselves are called bugs. Thus removing the errors are called debugging.

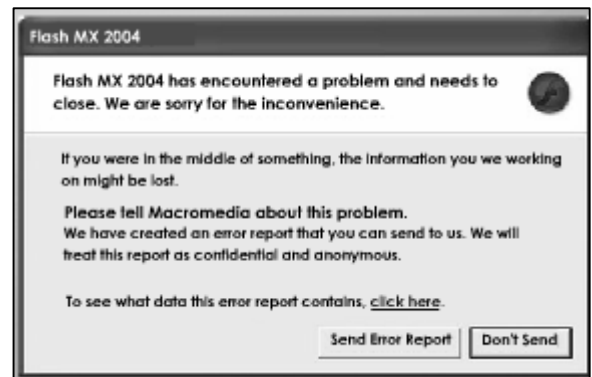


EXT : BETA

Some software companies distribute a beta version of their software to users. A beta version is a program that has most or all of its features and functionality implemented.

Users test the beta program and send in bug reports to the software company.

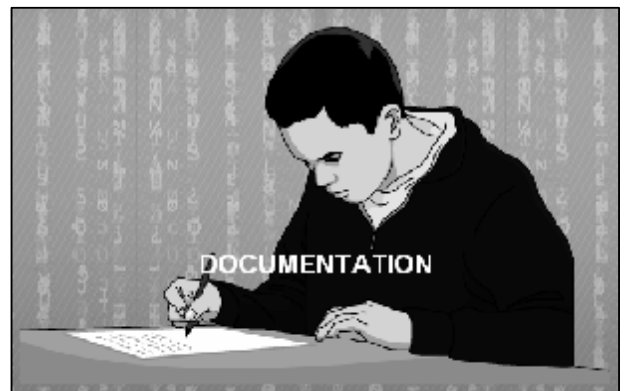
This enables the software manufacturer to fix any errors before the software is released to the public for sale.



LESSON 18 DOCUMENTATION

In program development, documentation refers to the written material generated throughout all the phases of program development.

Thus documentation includes the detailed problem definition, the program plan (flow chart or pseudo code), comments within the source program and testing procedures.



It also includes a detailed description of the program, clear layouts of input and output records and a program listing.

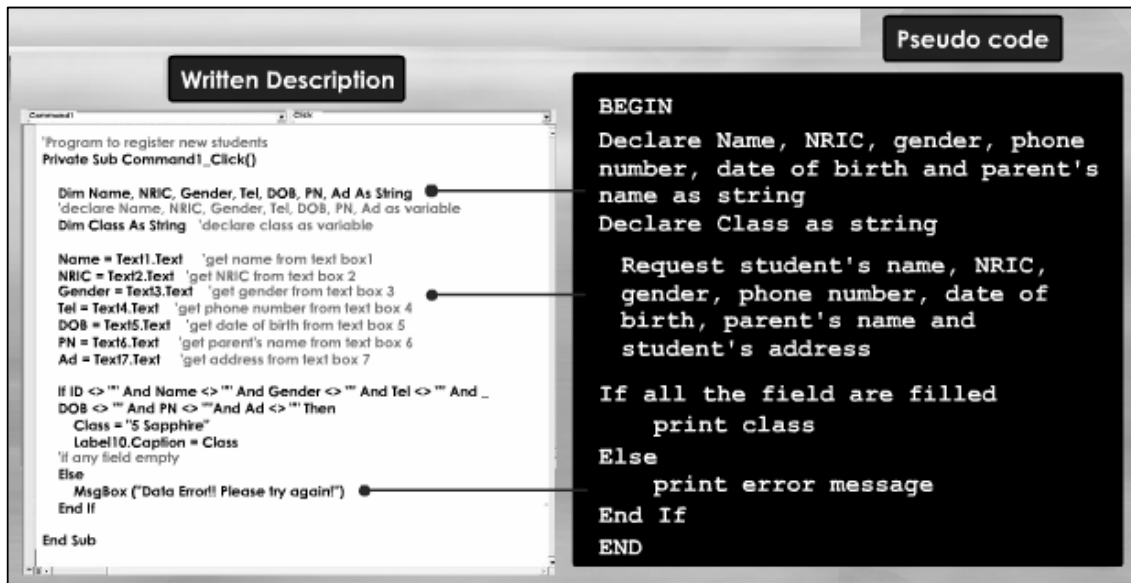
All documentation must be ready by the end of program development.

The programmer should ensure that all documentation is complete and accurate.

Documentation is very valuable if the program requires changes in the future as documentation enables new programmers to learn about existing programs much easily and quickly.

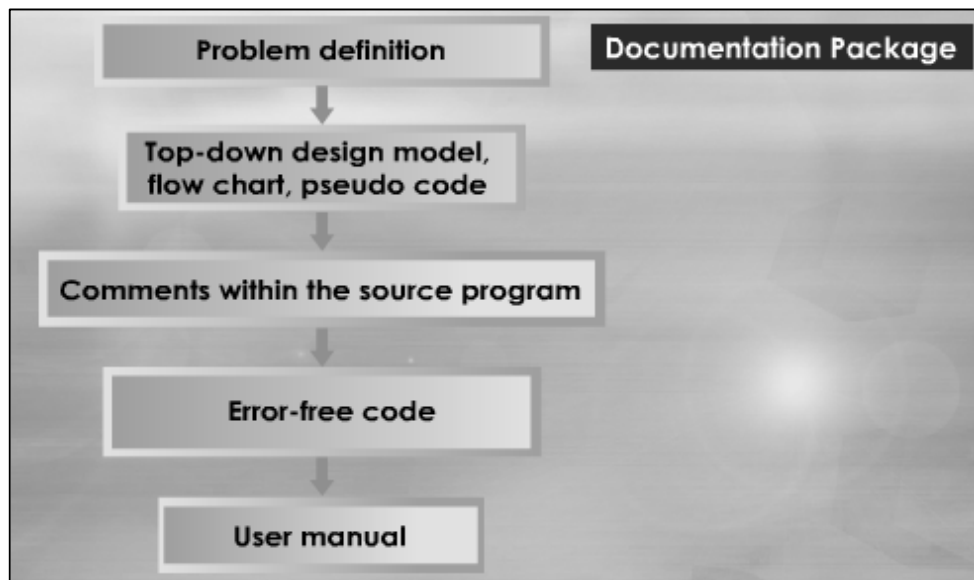
DOCUMENTATION

Documentation refers to the written description and pseudo code of computer programs.



Although documentation is stated as the last phase in program development, it is actually performed throughout all the five main phases of program development.

Documentation consists of materials generated during each phase.



Thus the documentation package is made up of the detailed problem definition, the program plan (flow chart or pseudo code), comments within the source program and testing procedures.

Other items in the documentation package also include a detailed description of the program, clear layouts of input and output records, and a program listing.



The programmer should ensure that all documentation is complete and accurate.

Documentation becomes especially valuable when the program requires changes in the future.

Proper documentation greatly reduces the amount of time a new programmer spends in learning about the existing programs.

INTERNAL DOCUMENTATION

Internal documentation consists of comments within the program. These two types of comments are global comments and internal comments.

```

Command1
Click
'Program to register new students Programmer: Hassan Date: 27/10/06
Private Sub Command1_Click()

Dim Name, NRIC, Gender, Tel, DOB, PN, Ad As String
'declare Name, NRIC, Gender, Tel, DOB, PN, Ad as variable
Dim Class As String 'declare class as variable

Name = Text1.Text 'get name from text box 1
NRIC = Text2.Text 'get NRIC from text box 2
Gender = Text3.Text 'get gender from text box 3
Tel = Text4.Text 'get phone number from text box 4
DOB = Text5.Text 'get date of birth from text box 5
PN = Text6.Text 'get parent's name from text box 6
Ad = Text7.Text 'get address from text box 7

If ID <> "" And Name <> "" And Gender <> "" And Tel <> "" And _
DOB <> "" And PN <> "" And Ad <> "" Then
Class = "5 Sapphire"
Label10.Caption = Class
Else 'If any field empty
MsgBox ("Data Error!! Please try again!")
End If

End Sub
  
```

Global comments, usually stated at the top of the program, explain the program's purpose and identify the program's name, its author and the date the program was written.

Internal comments, which appear throughout the body of the program, explain the purpose of the code statements within the program.

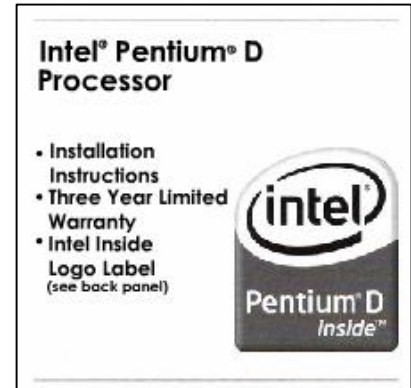
Internal comments are mostly addressed to other programmers who may have to make corrections or other modifications in programming language.

EXT : MARKETING DOCUMENTATION

It is important to provide some informative materials that enable people to learn more about the software product.

This form of documentation, called marketing documentation, has three purposes.

1. To interest potential users with the product and encourage them to get more involved.
2. To inform potential users about the product so that they know what to expect in return.
3. To compare the product with other alternatives.



LESSON 19 COMPUTER USERS

DEVELOP A PROGRAM

A project is a set of activities with a fixed start date and end date. Program development is also a type of project.

A successful program development project will result in one or more programs that are error-free, affordable, relevant to the needs of the users and delivered on time.

All the software that you find so helpful, educational and enjoyable today is the outcome of successful program development projects

For a program development project to succeed, the people involved must possess the appropriate set of communication, management and technical skills.

APPLY PROGRAM DEVELOPMENT PHASES TO SOLVE PROBLEMS

Problems	Solutions
• the number of books are increasing	• programmers help librarians to analyse their requirements and set up the library system
• registering or cataloguing their books	• programmers use library system to register or catalogue books in the library

Let's see how a programmer applies program development phases to solve the library problems.

Problem Analysis Phase

identifies the data input, processing and output for the program

Library System

Purpose:
computerise library system

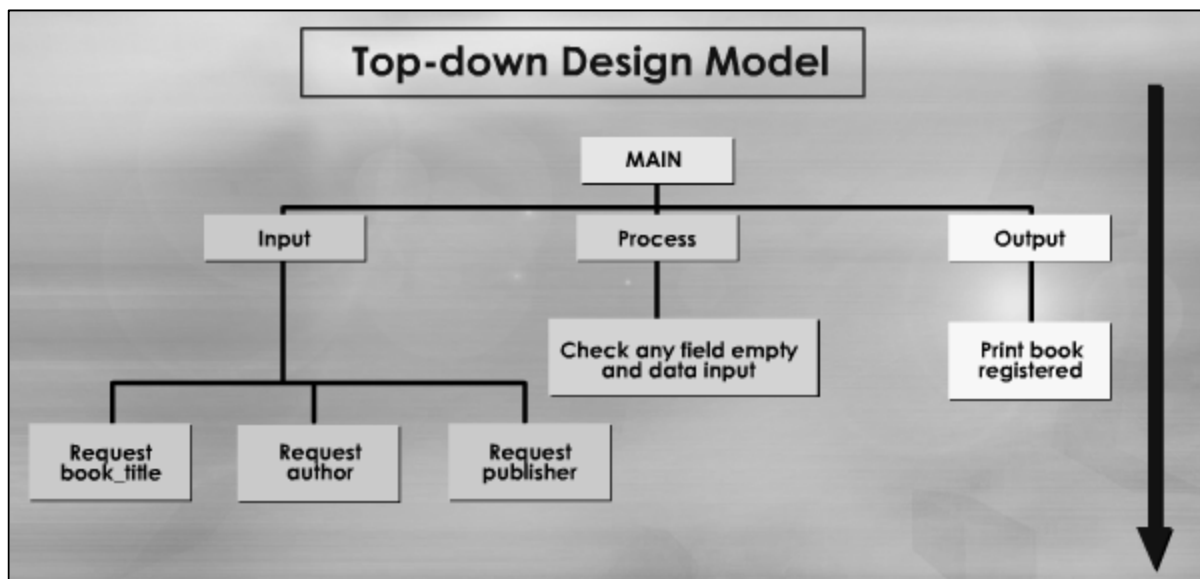
Data Input:

- Book's title
- Author
- Publisher

Processing
Get all the data
Check data

Output
Book registered!

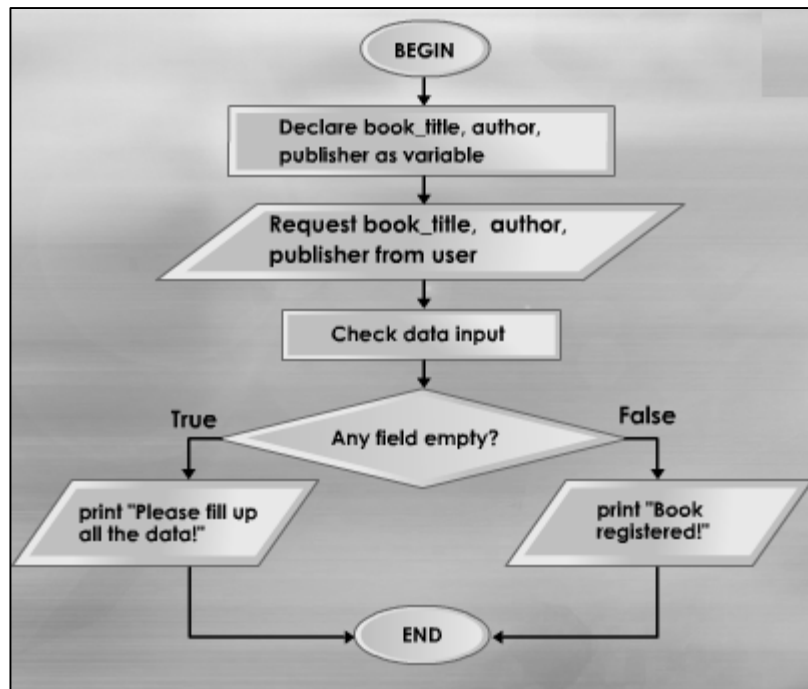
Program Design Phase

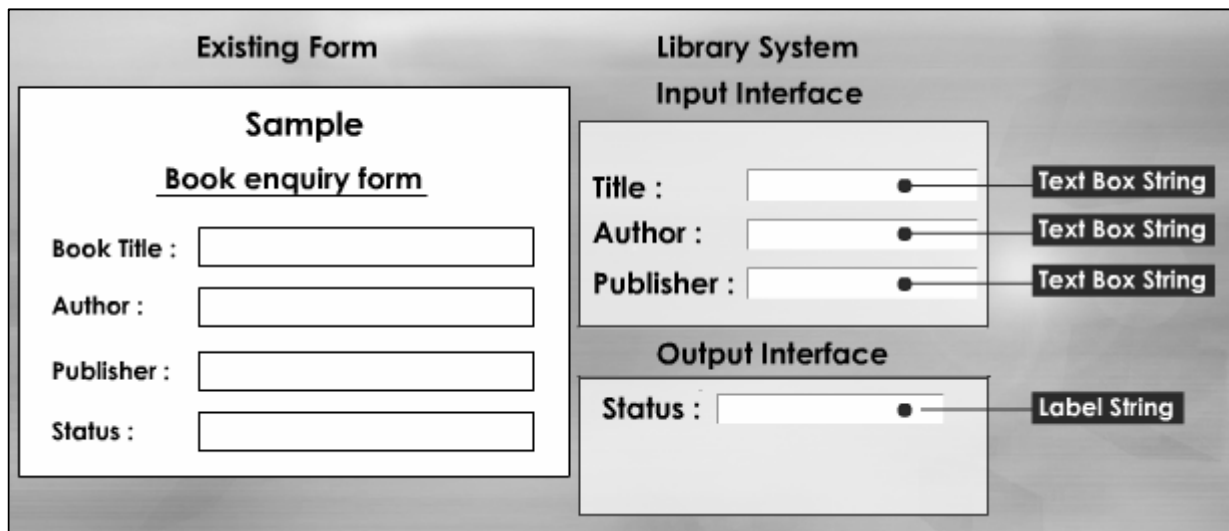


Pseudo code

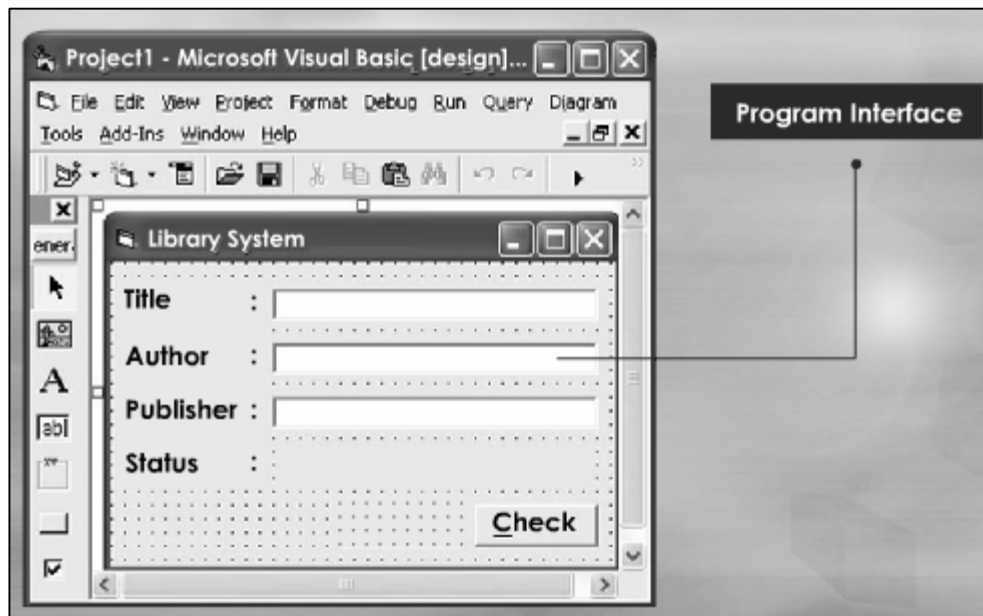
```
BEGIN
  Request book_title, author, publisher from user
  Check data input
  If any field empty Then
    print "Please fill up all the data!"
  Else
    print "Book registered!"
  End If
END
```

Flow Chart





Coding Phase



```

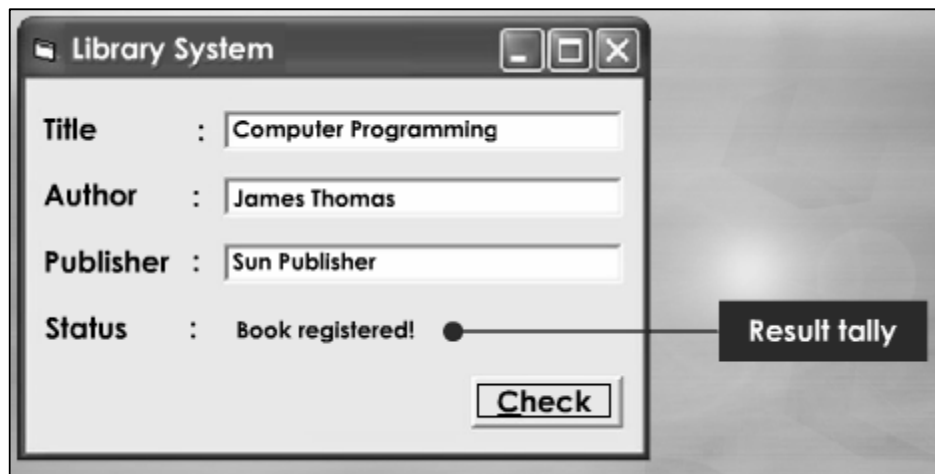
Project1 - Microsoft Visual Basic [design] - [Form1 (Code)]
File Edit View Project Format Debug Run Query Diagram Tools Add-Ins Window Help
Command1 Click
Private Sub Command1_Click()
    Dim book_title As String
    Dim author As String
    Dim publisher As Integer
    Dim Status As String

    book_title = Text1.Text
    author = Text2.Text
    publisher = Text3.Text

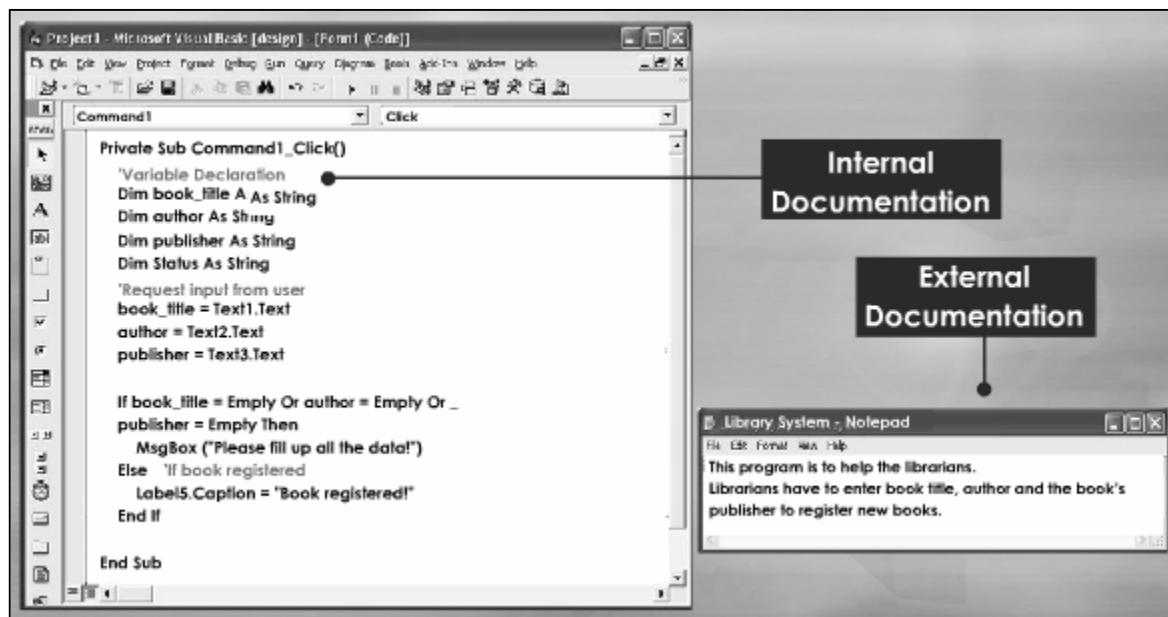
    If book_title = Empty And author = Empty Or _
    publisher = Empty Then
        MsgBox ("Please fill up all the data!")
    Else
        Label5.Caption = "Book registered!"
    End If
End Sub

```

Testing and Debugging Phase



Documentation Phase



EXT : TIPS AND TECHNIQUES

Let's learn a few tips and techniques on developing a new program using Microsoft Visual Basic 6.0.

- ✚ In Microsoft Visual Basic 6.0, undeclared variable will be assigned as variant type. Variant type is slow, consuming more memory than the others.
- ✚ Every procedure and module should have comments explaining their function. It will be easier for you to maintain the code later.
- ✚ Use descriptive words for your variables and control. It will be easier for other people to understand the program if you use this technique.

- ✚ When using graphic, use *.gif, *.jpg, and *.wmf picture formats instead of *.bmp. Bitmaps format consume more memory and may slow your program down.
- ✚ If you have some code which is repeatedly used, code it as independent module or function so that you can easily reuse them later.

LESSON 20 OVERVIEW OF THE LATEST TYPE OF PROGRAMMING LANGUAGES

THE LATEST TYPE OF PROGRAMMING LANGUAGES



FIFTH GENERATION LANGUAGES



Fifth generation programming language (5GL) is an advance programming language which concentrates on solving problems using constraints given to the program.

In fifth generation language, the programmer just need to define the problem to be solve and the program will automatically code the program based on the problem definition.

Fifth generation languages are designed to make the computer solve the problem for you.

Fifth generation languages are mostly used in artificial intelligence research.

Examples of fifth generation languages include Prolog and Mercury.



EXT : THE LATEST PROGRAMMING LANGUAGES: CAPABILITIES & DIFFERENCES

What can the latest programming languages do? How are they different from the previous or past programming languages?

Latest Programming Languages	Previous Programming Languages
<ul style="list-style-type: none"> • simplicity: aims to make programming simpler and more accessible to the public 	<ul style="list-style-type: none"> • would require a person to understand the computer system architecture and programming language syntax
<ul style="list-style-type: none"> • less work: aims to move the hard work from the human to the system 	<ul style="list-style-type: none"> • the computer that has to work hard computing the program code
<ul style="list-style-type: none"> • cross platform: it also eliminates the different hardware factor , the same code or input can be used in different target platform 	<ul style="list-style-type: none"> • is tightly related with the system's hardware and operating system