9 CAD Project Management Tool and UML

Topic Covered

1. **MS VISIO for designing and documentation of project**
2. **MS Project for Controlling and managing project**
3. **Steps to insert the Visio drawings into other Microsoft Office documents.**
4. **Steps for creating new diagram with Visio.**
5. **UML designing and skill based tools**
   - **Class diagram**
   - **Use case diagram**
   - **Activity diagram**

Introduction:

Computer-aided design (**CAD**) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing.CAD output is often in the form of electronic files for print, machining, or other manufacturing operations.

Computer-aided design is used in many fields. Its use in electronic design is known as Electronic Design Automation, or **EDA**. In mechanical design is known as Mechanical Design Automation, or **MDA**, it is also known as **computer-aided drafting** (**CAD**) which describes the process of creating a technical drawing with the use of computer software.

CAD software for mechanical design uses either vector based graphics to depict the objects of traditional drafting, or may also produce raster graphics showing the overall appearance of designed objects. However, it involves more than just shapes. As in the manual drafting of technical and engineering drawings, the output of CAD must convey information, such as materials, processes, dimensions, and tolerances, according to application-specific conventions.

CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids in three-dimensional (3D) space.

CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals, often called DCC Digital content creation.

MS-VISIO FOR DESIGNING AND DOCUMENTATION

Microsoft Office Visio is a diagramming and vector graphics application and is part of the Microsoft Office suite. The product was first introduced in 1992, made by the Shape ware corporation. It was acquired by Microsoft in 2000.

• MS-VISIO is diagramming and vector graphics application and is a part of Microsoft Office Suite.
• The product was first introduced in 1992, made by the Shapeware Corporation. It was acquired by Microsoft in 2000.
• One of the versions of Microsoft is MS VISIO 2010 for windows, is available in three editions: Standard, Professional and Premium.

The Standard and Professional editions share the same interface, but later on it has additional templates for more advanced diagrams and layouts, as well as unique capabilities intended to make it easy for users to connect their diagrams to data sources and display their data graphically.

• The premium edition features three additional diagram types as well as intelligent rules, validation and sub process (diagram breakdown).

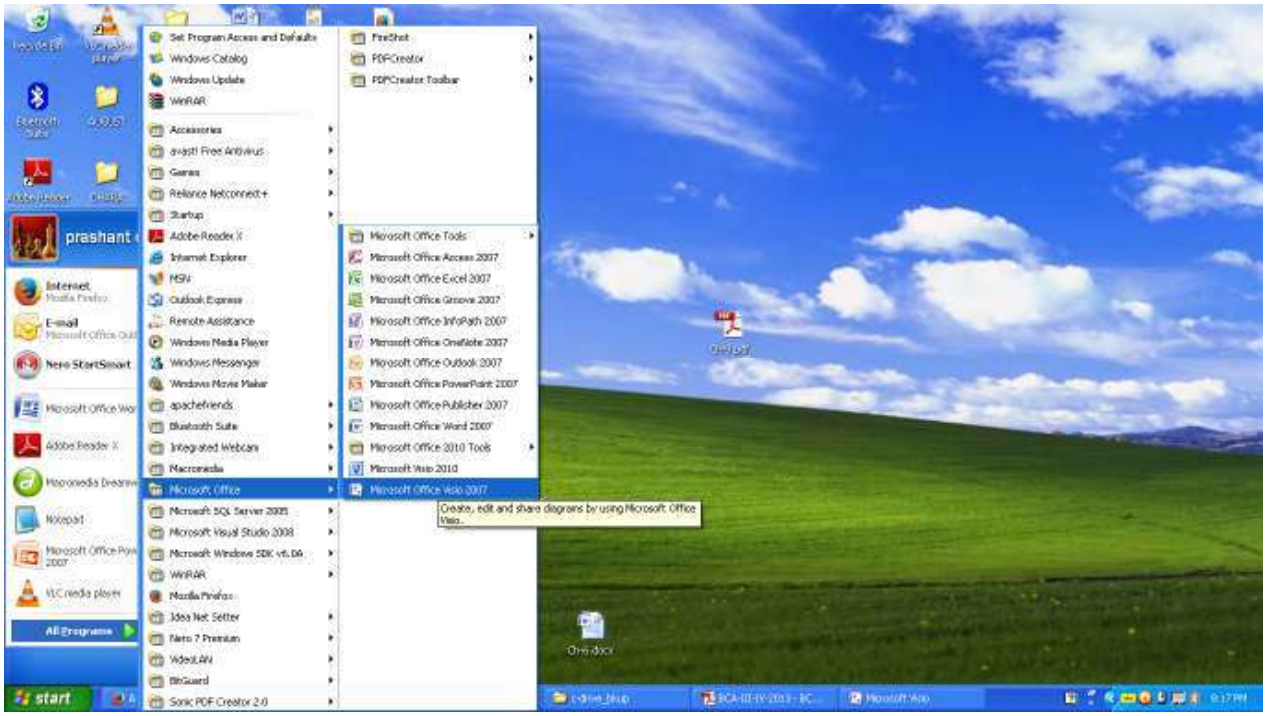
The new Microsoft Visio has:

- Features designed to make it easier to create diagrams including quicker access to frequently used tools, new & updated shapes and patterns, and improved themes and effects.
- Tools to make teamwork easy, such as the ability to work together on the same diagram at the same time.
- Improved touch support, including for Windows 8 and Visio Services in the new Microsoft SharePoint.
- Options to make your diagrams more dynamic by linking shapes to real-time data.
- The ability to share your diagrams with other through a browser (even if they don't have Visio Installed) through Microsoft Office 365 or SharePoint.

• Let's discuss an example of drawing flow chart using Microsoft Visio:

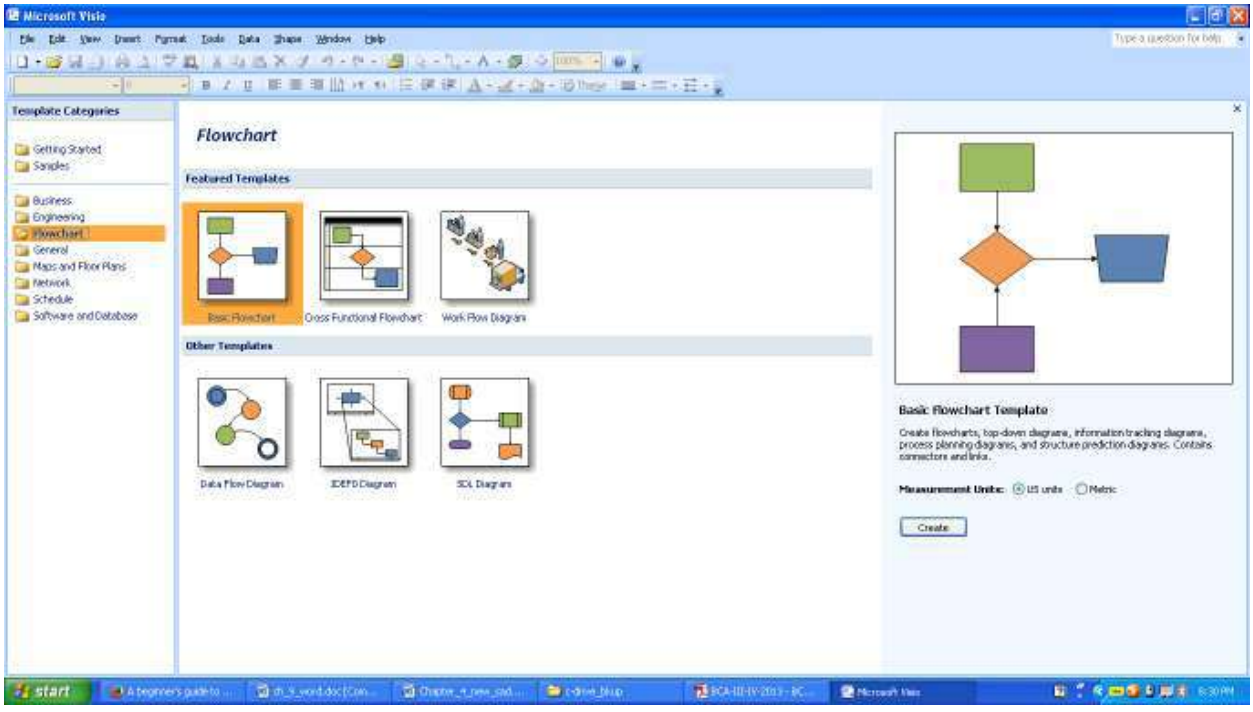
Step 1: To open a new Visio Drawing, go to the Start Menu and Select Programs - > Microsoft Office - > Microsoft Visio 2007. (Figure1).

Step 2: Move your cursor over "Template Category" and select "Flowchart".



• ***Creating a new diagram :***

Step1: Select a shape from the Shapes menu, and drag it to the workspace.

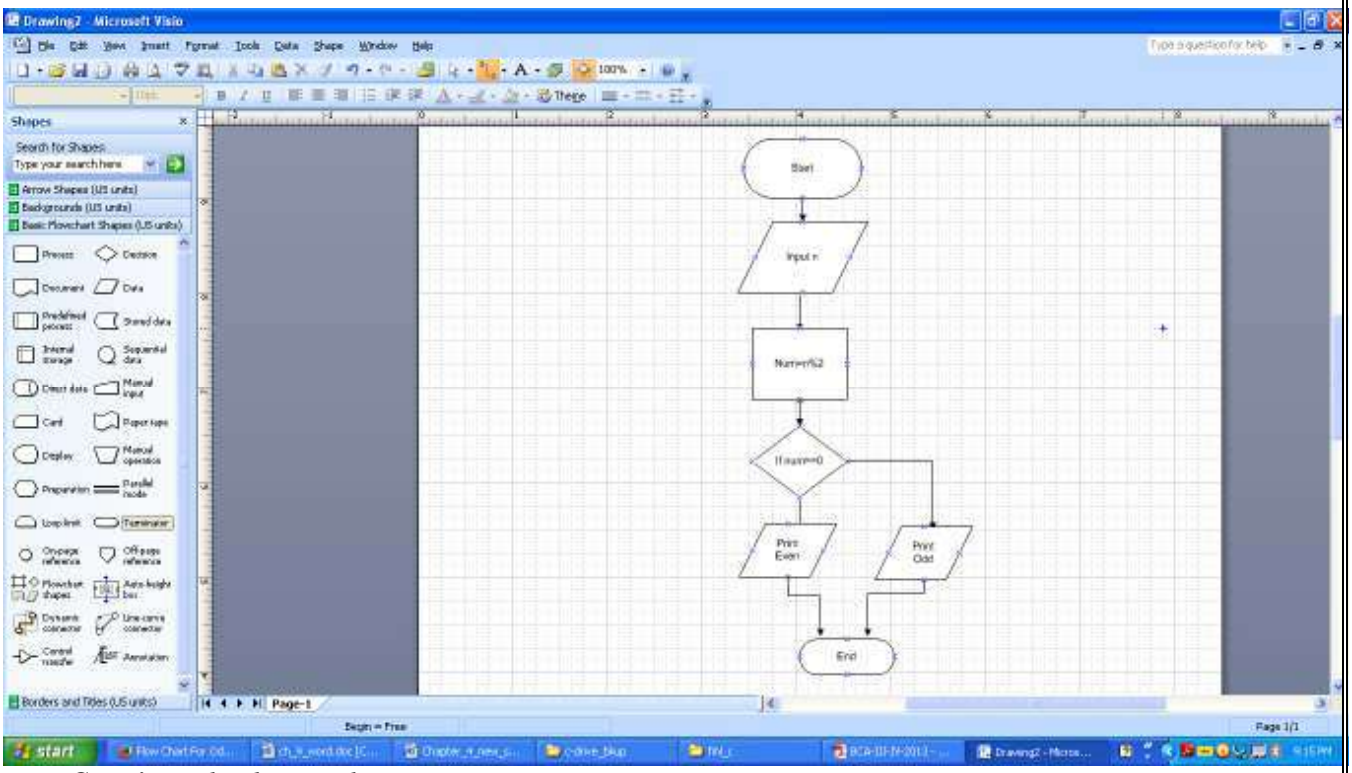


Step 2: On the toolbar, click the connector tool will appear highlighted and will remain active until it is deselected.

Step3: With the first shape still selected, drag a second shape to the workspace. The shapes are connected automatically when the connector tool is turned on.
Step4: Continue adding shapes until you have enough to include all of the steps in the business process being outline. The example here illustrates a multi step process.
Step5: Shapes can be resized or moved, and the connectors will remain intact. At this point, your diagram should look something like the following example.

Adding text to a diagram and formatting the text :
Step 1 : Double click on a shape to enter text. There is no need to create a text box (as required with Microsoft Word or PowerPoint Shapes); Visio does this automatically for you.

Step 2 : The default format for text in Visio is Arial 8-point font. The most efficient way to format is to enter all of the test, then format all of the shapes at once. To do this, click on one of the shapes to select it. Hold down the Shift key, and click on the other shapes you wish to format.



• ***Creating a background:***
Step1: From the menu on the left side of the screen, click on "Backgrounds".
Step 2: Click on a design, drag it over your drawing, and drop it on your workspace.
• ***Modifying the color scheme:***
Step 1: Right click on your workspace and select "Color Schemes".

Step 2: The color scheme menu will open, select a scheme from the menu and click apply. Preview different color schemes, then select "OK" when you find one you like.
Step 3: Sometimes you need to change the color of one or two shapes for impact. To do this, select the shape you wish to change, then click on the print bucket tool, located in the formatting toolbar. Select a color by clicking on it, and only the shape you selected will change.

• Visio drawing can be printed out just like any other Microsoft document. From the toolbar, select File->Print.

Steps to insert the Visio drawings into other Microsoft Office documents:

• Visio drawings can also be inserted into other Microsoft Office documents such as PowerPoint or Word.

Step 1: From the Visio toolbar, select Edit->Copy drawing.
Step 2: Open your PowerPoint presentation or Word document, and position your cursor where you would like to insert the Visio drawing.
Step 3: Select Edit -> Paste.
Step 4: To change your drawing, double click on it (while still in PowerPoint or word), and Visio will open within PowerPoint or Word for what is called in-place editing.

MS-VISIO FOR DESIGNING AND DOCUMENTATION:

• **Microsoft Project** is a project management software program developed and sold by Microsoft.

• It is designed to help a project manager in project planning, assigning resources to tasks, progress tracking and budget management and to analyze workload.

• Being a part of Microsoft office, it is never included in any office suites. Currently it is available in two editions; **Standard and Professional**.

• Project creates budgets based on assignment work and cost of resources. As resources are assigned to task and assignment work estimated, the program calculates the cost, equal to the work times the rate, which rolls up to the task level and then to any summary tasks and finally to the project level.

• Resource like people, equipment and materials can be shared between projects using a shared resource pool. Each resource maintains, its own calendar, which defines what days and shifts a resource is available.

• Each resource can be assigned to multiple tasks in multiple plans and each task can be assigned multiple resources, and the application schedules task based on the resource availability as defined in the resource calendars.

• All resources can be defined in label without limit. Therefore it cannot be determine how many finished products can be produced with a given amount of raw materials.

• This makes Microsoft Project unsuitable for solving problems of available materials constrained production. Additional software is necessary to manage a complex facility that produces physical goods.

• The application creates critical path schedules, and critical chain and event chain methodology third-party add-ons also are available. Schedules can be resource leveled, and chains are visualized in a Gantt chart.

• Additionally, Microsoft Project can identify different classes of users. These different classes of users can have differing access levels to projects, views and other data.

• Custom objects such as calendars, views, tables, filters and fields are stored in an enterprise global which can be shared by all users.

What is UML ?

The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the artifacts of software systems, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing object oriented software and the software development process.

The UML uses mostly graphical notations to express the design of software projects.

Using the UML helps project teams communicate, explore potential designs, and validate the architectural design of the software.

Goals of UML

1. Provide users with a ready-to-use, expressive visual modeling language so they can develop and exchange meaningful models.
2. Provide extensibility and specialization mechanisms to extend the core concepts.
3. Be independent of particular programming languages and development processes.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of the OO tools market.
6. Support higher-level development concepts such as collaborations, frameworks, patterns and components.
7. Integrate best practices.

Why Use UML?

As the strategic value of software increases for many companies, the industry looks for techniques to automate the production of software and to improve quality and reduce cost and time-to-market.

These techniques include component technology, visual programming, patterns and frameworks. Businesses also seek techniques to manage the complexity of systems as they increase in scope and scale.

In particular, they recognize the need to solve recurring architectural problems, such as physical distribution, concurrency, replication, security, load balancing and fault tolerance.

Additionally, the development for the World Wide Web, while making some things simpler, has exacerbated these architectural problems. The Unified Modeling Language (UML) was designed to respond to these needs.

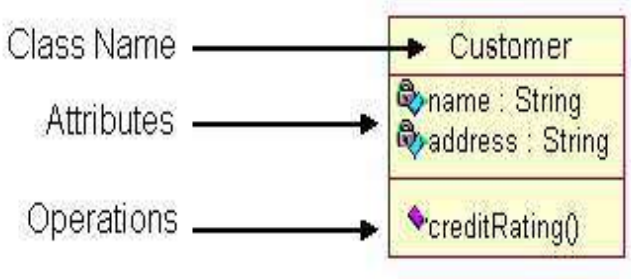
Class Diagrams

Class diagrams are widely used to describe the types of objects in a system and their relationships.

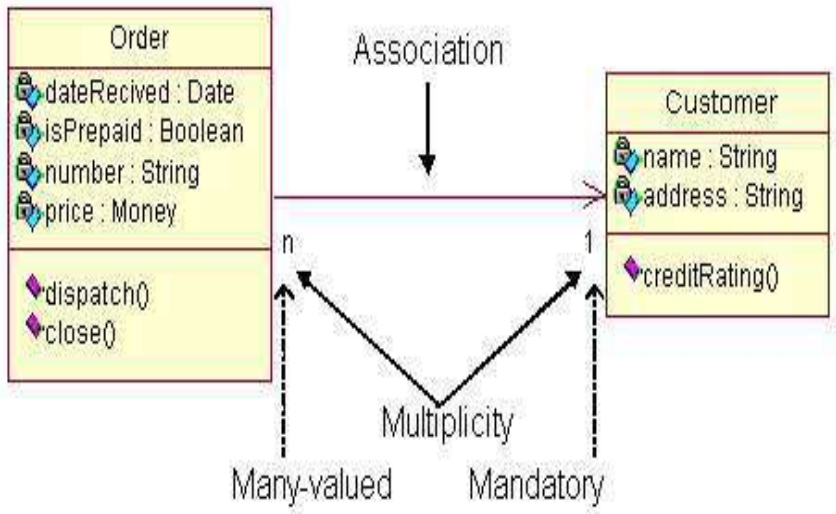
Class diagrams model class structure and contents using design elements such as classes, packages and objects.

Class diagrams describe three different perspectives when designing a system, conceptual, specification, and implementation.

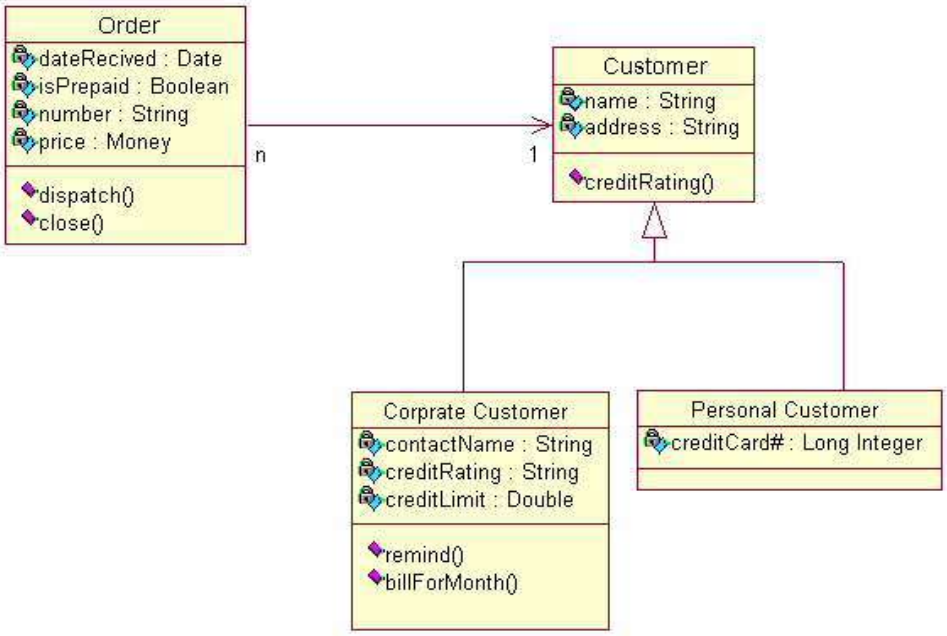
Classes are composed of three things: a name, attributes, and operations. Below is an example of a class.



Class diagrams also display relationships such as containment, inheritance, associations and others. Below is an example of an associative relationship:

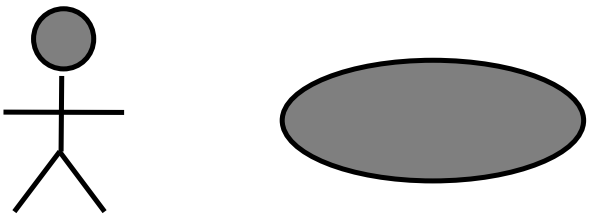


Example Of Class Diagrams :



Use Case Diagrams

A use case is a set of scenarios that describing an interaction between a user and a system. A use case diagram displays the relationship among actors and use cases. The two main components of a use case diagram are use cases and actors.



Actor Use Case

An actor is represents a user or another system that will interact with the system you are modeling. A use case is an external view of the system that represents some action the user might perform in order to complete a task.

Use Case For user placing an order with a sales company

Activity Diagrams

- An Activity diagrams show the flow from activity to activity.
- It is an ongoing execution within the software. Activity ultimately results in some action which is one type of computation result.
- Action than call another operation, sending signal creating or destroying an object of computation
- It gives the dynamic view of a system. It shows activity within the state.

Following symbols are used in activity diagram.

How to Draw: Activity Diagrams

- Activity diagrams show the flow of activities through the system.
- Diagrams are read from top to bottom and have branches describe conditions and parallel activities.
- Branch is used when multiple activities are occurring at the same time.
- This indicates that both activity2 and activity3 are occurring at the same time. After activity2 there is a branch.

- The branch describes what activities will take place based on a set of conditions.
- All branches at some point are followed by a merge to indicate the end of the conditional behavior started by that branch.
- After the merge all of the parallel activities must be combined by a join before transitioning into the final activity state.

Example Of Activity Diagrams :